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THE A.V.A. CONVENTION

New York City is inviting all vocational and industrial-arts teachers to the sixth annual convention of the American Vocational Association, to be held December 9–12.

Considering the many things that New York City has to offer, the attendance at the 1931 convention will no doubt eclipse all former records.

MORE CONVENTION DATES

Maryland Vocational Education Association, Baltimore, Md., Oct. 23–24.

Manual-Training Section, Eastern Tennessee Educational Association, Knoxville, Tenn., Oct. 30–31.

Wisconsin Vocational Association, Milwaukee, Wis., Nov. 5–7.

Illinois Vocational Association, Chicago, Ill., Nov. 7–8.

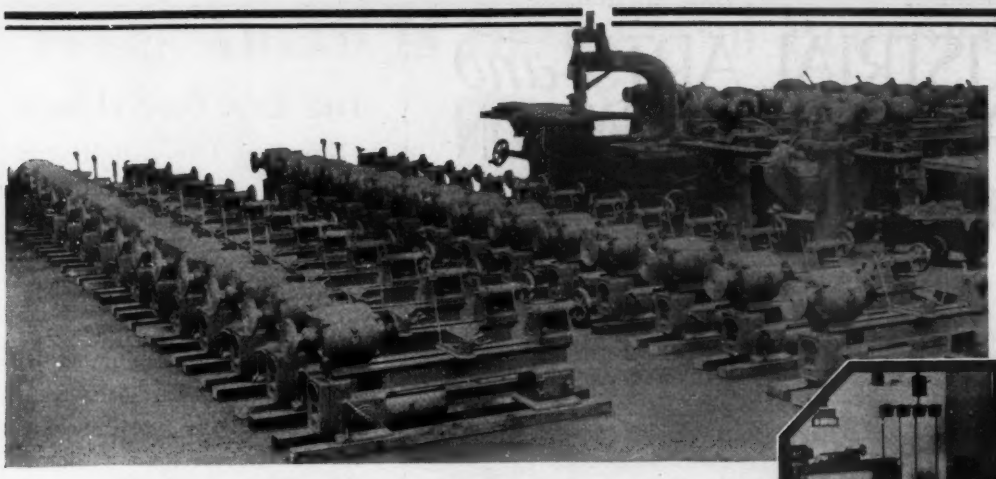
Iowa Vocational Association, Des Moines, Iowa, Nov. 12–14.

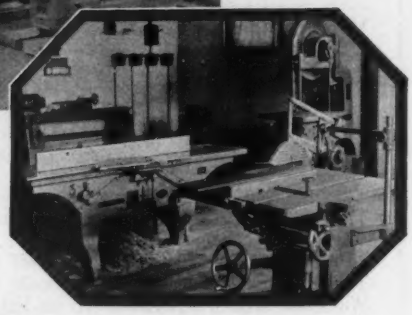
Virginia Vocational Association, Richmond, Va., Nov. 24–28.

THIS MONTH'S COVER

The machine-shop students pictured on the cover this month are from the Peckham Vocational School, Buffalo, N. Y.

Photo submitted by Hiram E. Greiner, Old Central High School, Buffalo, N. Y.





The upper photograph is a shipment of 30 bench type head stock lathes at the Beloit plant, being prepared for shipment to a technical school in New York City.

At the right is a typical installation of Yates-American equipment being used in a high school in Arkansas.

From Broadway to Main Street

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Volume 20 NOVEMBER, 1931 Number 11

Differences Existing Between British and American Technical Education[1]

Thomas Diamond *

THE British evening technical classes are entirely different from their continuation classes. In the United States no clear-cut distinction is made in many cases between continuation work and industrial education. In Great Britain, work provided under the title of technical education is not offered to remedy the defects of early education. Rather it is given "to provide instruction in the principles, scientific or artistic, underlying the various occupations for those who will be unable to complete their studies at the day Technical College."[2]

Another function of the technical classes is to provide an opportunity for a number of students who, because of aptitudes discovered or interests developed, may later desire to complete their work at the day college.

In addition to the evening work, there are those who spend two or three years in the day college and complete their work by a short special apprenticeship. This is not unlike the plan followed by some of our large corporations which take engineers from four-year colleges and require them to spend a certain period in each department in order to prepare them to fill positions as designers, salesmen, and engineers.

Another method in use might be recognized as our own coöperative plan. There is evidence to indicate that this plan has been in operation in Great Britain under the name of the "Sandwich" plan for a number of years.

One of the outstanding differences between the schoolwork offered for workers in Great Britain as compared with that provided in the United States lies in the relative emphasis placed on the manipulative side of the man's job and on the theoretical side.

In this country much emphasis is placed on training the man to perform certain manipulative processes, hence the worker is given an opportunity to go to school and learn the rudiments of tool manipulation. If he is taught any of the theory it is frequently incidental and little effort is made in many cases to check up whether he understands its significance in relation to his work.

In Great Britain most of the energy of the teaching staff has been devoted to teaching theory, and it seems to be assumed that when skill has to be developed, it can be done more advantageously in the factory. It is true that an increasing number of schools provide courses in actual manipulative work. In all of these schools an exceptionally fine quality of work is being maintained, despite the fact that their shop equipment is meager and out of date when judged by American standards. Notwithstanding this, their greatest effort is devoted to class or laboratory work and, as a matter of fact, any government grant earned depends more upon the principles taught than upon the practice provided. This fact is clearly brought out in the following quotation from one of the publications of the board of education: "Practical work in crafts or trade processes was not excluded from recognition, but in fixing a rate of grant, regard was had to the extent to which the instruction elucidated principles and their application, as distinct from affording practice directed to the acquisition of manipulative skill."[3]

Another difference between the technical education of Great Britain and the corresponding industrial education of the United States lies in the fact that the Britisher looks upon his education as a progressive affair. He considers courses only as parts of a whole and believes that such parts only furnish a basis for further education. In contrast to this the young worker in this country is encouraged to consider most courses as complete in themselves, and rarely is he urged to look for-

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[1]The writer is conscious of the fact that it is difficult and often dangerous to make comparisons. This is particularly true when the individual making the comparisons has had only a brief contact with conditions on one of the sides of the question. Because of this the statements contained in this article refer only to the more obvious questions and any statements made are presented frankly as opinions, and not as the result of scientific research.

[2]Creasaly, *Technical Education in Evening Schools*, p. 14.

[3]Board of Education, *Educational Pamphlet No. 49*, 1926, p. 17.

ward to the completion of a larger and more comprehensive unit in which the course is merely a step.

Of course, not every young Britisher completes his course; it is obvious, however, that he has an objective set before him which calls for long and continuous application. The courses are so arranged that each individual proceeds with his program at a pace which is in keeping with his industry and capacity. When unusual ability or interest becomes apparent the student displaying it finds himself a subject for much personal attention on the part of the school authorities who spare no effort to groom him for one of the many scholarships which are available for assisting and encouraging students with exceptional ability. Thus each individual climbs the educational ladder of his choice at his own pace, dropping off where he pleases, but always having a definite objective before him as an incentive to further effort. If he is of the type that is likely to make a success in the field he chooses, the task he has before him will inspire him to greater and still greater effort. If he is not, no effort is made to lighten the task for him.

In certain cases, permission is given to students to elect special units in which they are interested, but the tendency has been to discourage this. The extent to which this is true is indicated in the following paragraph taken from a technical-college report of 1923.[4]

"Of the 2,013 students on the roll, 90 were under 16 years of age on admission, 1,183 were between 16 and 21, and 740 were 21 or over. The largest numbers in the last section were in building and civil engineering (111), textiles (192), and domestic classes (177) — these have two thirds of the older students in the college. . . . The proportion of students taking courses which involve attendance on three nights a week is 89 per cent in mechanical engineering, 94 per cent in electrical engineering, 79 per cent in building and civil engineering, 83 per cent in chemistry, and 59 per cent in textiles."

The full significance of this report, insofar as its relation to "grouped courses" is concerned, will be clear when it is known that the students reported as attending three nights a week are following courses of this type.

The instructions in each year of the course requires attendance on three evenings a week for about 28 weeks in the year. Minor courses may require attendance on only two evenings a week for the same period. Promotion from year to year depends upon regular attendance, classwork, and homework, as well as upon success in examination.

Objections to the Present Plan

While it is true in general that each student is called upon to follow a course covering a longer or shorter period, there is evidence to show that there are those who believe that some change is desirable. For example, Mr. Hyslop, one of His Majesty's inspectors, draws attention to the following data in connection with a particular school:[5]

First-year students in attendance.....	2,669
Second-year students in attendance.....	1,213
Third-year students in attendance.....	855
Fourth-year students in attendance.....	314
Fifth-year students in attendance.....	173

It will be noted that only 173 students out of a possible 2,660 completed the fifth year. Mr. Hyslop contends that this is a clear indication that the courses are designed for the smaller group rather than for the larger group who never complete the work. In commenting on this, he says:[6]

"It is held by many competent critics that the courses are too severely mathematical and have little bearing on the daily work of the majority of the students, that, in fact, they are eminently suitable for the draftsman, but not for the craftsman, while the uniform final examinations, held in the third and later years, are considered too difficult and exacting. There may be considerable truth in these objections, but so long as the Royal Technical College maintains its present high standard of entrance, it does not seem easy to make radical changes in the schemes of work. However that may be, it can hardly be disputed that a considerable body of students enroll in the affiliated classes, not because the courses are suited to their needs, but because there is little else available for them. Such students have often no desire to complete the full course, and, for them, courses less abstract in character, more concrete, and more directly related to their daily work, seem desirable. Provision for trade courses of this kind is, of course, the function of the educational authorities, but the expense involved in running parallel courses, with duplicate staff and equipment, renders the task almost impossible of fulfillment, except in the largest centers. It may be that some measure of centralization might help to solve the problem."

Mr. Frewin, another inspector, also expresses himself as not being entirely satisfied with the course system. In his report[7] for 1926–27, he says:

"The schemes of work are drawn up on the assumption that the pupils in the first year will actually arrive at the Central Institution. Unfortunately, of the students who commence a course, only a few reach the goal — so many unforeseen circumstances arise. The problem here is to plan the work so as to suit all, and in many cases the teachers complain that the schemes laid down by the Central Institutions are not ideal from the point of view of the general student. At one center, Falkirk, the difficulty has been met by running, in certain subjects, two classes — affiliated and non-affiliated. This is certainly not an economical solution and it is even very doubtful whether it is in the best interests of the pupils."

Thus we see that, although emphasis is placed upon longer courses, there is a feeling abroad that short-unit

[4] *The System of Technical Education in England and Wales*, p. 9.

[5] *Report of the Committee of Council on Education in Scotland*, 1926–27, p. 15.

[6] *Ibid.*, p. 15.

[7] *Ibid.*, p. 16.

courses would more effectively meet the needs of a majority of the students.

That some progress has been made in this matter may be judged from the fact that exception is made in some instances in the case of mature workers. In one city this idea was carried to the extent that one night a week was set aside as "journeyman's" night. The enrollments in the classes on that night were strictly limited to full-fledged tradesmen with the result that a much more advanced type of work could be done. This idea of having the journeyman come to school on an evening when the younger people are free is bound to induce many of the older men to attend, as the average tradesman dislikes having to enter a class in competition with apprentices, and frequently dislikes having to admit before them that there are things about his trade which he has yet to learn.

As further evidence that a change of policy is gradually taking place in regard to providing individual shop courses, the following table[8] is presented, showing the extent to which they are offered in England and Scotland:

Area	*Number of Schools in Which Shop Courses are Offered*	*Number of District Trades in Which Shop Courses are Offered*
London	226	68
England	178	66
Scotland	24	44

Evening versus Day Classes

Many who have observed the work in technical education in Great Britain object to a great deal of it because it is done in the evening. They claim that a worker cannot do effective work in his class after he has done nine hours' work in a factory. As evidence of this, cases have been quoted of young men who have been so exhausted that they actually fell asleep in class. That this feeling is common in Great Britain is brought out by the reports of various educational authorities. The following quotation may be taken as indicating the general opinion of administrators in the United Kingdom:[9]

"It must be admitted that evening schools are an expedient only, and cannot be accepted as an efficient or an adequate substitute for day continuation schools. Students of adolescent age cannot be expected to gain the greatest benefit from classes attended after a day's work at their employment. Moreover, it is difficult to establish and maintain the true school atmosphere in evening schools. The classes meet on three evenings in each week, for two hours each evening, and for 26 weeks in the year. Inclement weather, the calls of employers, and the many attractions of a great city cause the frequent absences which are inseparable from school attendance under a voluntary system. Again, the work of evening schools is necessarily intensive, and cannot, therefore, assist to any material extent in forwarding the true educational spirit. But despite these drawbacks, incidental to evening schools, much excellent work is being done."

A discussion of the question with a number of students revealed the fact that they also felt that it is a poor time to study, but they pointed out that most students have no choice in the matter; they must do their studying at the end of the day, or they don't do it. It is obvious therefore that, whether we agree with evening classes or not, the fact remains that they provide an opportunity for many who later in life begin to appreciate the value of an education and who must continue on the job while they get it.

The Cost to the Student

Again, some depreciate the work in Great Britain on the grounds that the student must pay for his courses. This argument is hard to understand in the face of the fact that students desiring similar education in America must also pay a fee. Furthermore, there are some administrators in this country who believe that this fee should be increased, on the grounds that the inter-

[8] *Handbook to the Technical and Art Schools of the United Kingdom.*

[9] *Manchester Education Committee General Survey*, 1914–24, p. 118.

Cost of Public Evening-School Classes in Five Cities of the United States

Subject	*Cities* A *Fees not Returned*	B *Fees not Returned*	C *$1 Returnable for Attendance*	D *$3 Returnable for Attendance*	E *Fees not Returned*
Plumbing	$7.50	$3.00	$2.00	$5.00	$....
Machine Shop	7.00	3.00	2.00	5.00	....
Printing	6.00	3.00	2.00	5.00	....
Patternmaking	6.00	3.00	2.00	5.00	....
Drafting	6.00	3.00	2.00	5.00	3.00
Auto Mechanics	6.00	3.00	2.00	5.00	3.00
Electricity	6.00	3.00	2.00	5.00	....
Dressmaking	6.00	3.00	2.00	5.00	3.00
Millinery	6.00	3.00	2.00	5.00	....
Cooking	6.00	3.00	2.00	5.00	3.00
Bookkeeping	6.00	3.00	2.00	5.00	4.00
Blue-Print Reading	3.50	....	2.00	5.00	2.00
Shop Mathematics	3.50	3.00	2.00	5.00	2.00
Business English	3.50	3.00	2.00	....	3.00
Acetylene Welding	....	....	3.00	5.00	....
Any Course in Science	....	....	6.00 and Lab. Fee	....	4.00

est of the students seems to increase directly with the size of the fee. It has been found that the enrollment falls off perceptibly when the fees are raised, but the standard of the students rises, and the student mortality has a tendency to decrease.

The popular evening-school fee in this country is $1, which, in many cases, is returned if a certain standard of attendance is attained. However, there are public evening schools where the fees are much higher and where no refund is made to the student regardless of his attendance or scholarship. For example, one school in the middle west charges a flat fee of $3, while another school — also public — has a scale of charges ranging from $3 in the case of commercial work up to $10 for machine-shop classes. The interesting thing about the latter school is that the classes are crowded and the machine shop is open five nights a week. The following chart gives some indication of the costs of evening classes in five cities located within a radius of fifty miles in the middle west.

In all five cities the students must pay for their materials in the shop courses. In city D a breakage fee is required for such courses as physics and chemistry. In city C all science courses have a fee of $6 plus a laboratory fee.

In view of these conditions in the United States, it is of interest to note the following in a report of the English Board of Education:

"The fees for junior technical courses cost from 60 cents to $1.84 a year. We also find that the senior and advanced courses cost from $1.50 to $16."

When we consider that many of these advanced courses are of college grade, although not taken for college credit, and that such courses as the chemistry of dyes or coal-tar products necessitate extensive laboratory equipment and supplies, it is surprising that the cost is not greater than it is.

Then, too, in Great Britain each student who pays his 60 cents or $16 has almost an unlimited opportunity to win more than the value of his expenses. While the student who has particular aptitude in any line, not only has free tuition assured, but he has many opportunities to win scholarships which enable him to become a regular student at one of the many leading universities.

When we balance the costs in the two countries and weigh those against the opportunity offered, we wonder if the Britisher pays for his technical training any more than does the American.

Technical Education

It would appear that the work in the field of technical education in Great Britain has not developed in recent years in any way comparable to the development in the United States. One of the main reasons for this seems to have been that the general movement for retrenchment resulting from the war became a national necessity in Great Britain. As is customary in times of financial stress, the schools suffered, particularly that phase of schoolwork which had to do with adult education. This fact is illustrated by the following table:[10]

Number of Schools of Varying Sizes in 1915 and 1925, Respectively

Year	*Below 80*	*80 to 100*	*100 to 120*	*120 to 150*	*150 to 200*	*200 to 300*	*300 to 500*	*500 to 1000*	*Over 1000*	*No. of Schools*
1915.....	16	13	12	11	15	4	4	2	2	79
1925.....	3	4	6	11	17	8	6	3	3	61

It will be noted that in the ten-year period under consideration, the number of schools in which technical classes were offered dropped from 79 to 61. Not only this, but a centralization had been going on, as may be seen from the fact that the number of schools with 80 or fewer students decreased tremendously, while all the groups with 150 or more students have an increased number of schools listed. Despite this decided decrease in facilities it is of interest to know that in 1925 the number of students enrolled had increased by 3,550, the total then being 18,150.

When we compare the physical plants of the schools in the two countries we find that the British buildings and equipment are rather inadequate. Their buildings seem old, poorly arranged, and badly lighted, and their equipment is meager and, in many cases, more or less obsolete. This again may be explained by the obvious lack of money and the apparent determination to make the best of existing conditions.

It is unfortunate that many Americans who visit Great Britain, conclude that because of these conditions the work done is equally poor. It is intensely gratifying to report that this is contrary to the fact, and that the standard of work done is high. It is difficult to make comparisons in regard to conditions which cannot be accurately measured. However, generally speaking, the shopwork is as good as, and frequently better than is found in most American school shops. Furthermore the theoretical work is infinitely better than anything the writer has had an opportunity to observe in this country in schools of similar grade.

As we compare the work in the two countries we find much that is good in both. The short-unit courses common in the United States may not be any better, but they cannot be said to be inferior to the grouped courses in vogue in Great Britain. Again the emphasis we place upon manipulative work may be caused by the fact that we have almost unlimited means to purchase the most modern equipment, while the emphasis placed by the British on theoretical work may be the direct result of their inability to finance a shop program. Whatever the reasons for the differences are, it is obvious that those interested in the work on both sides of the Atlantic are sincere in their efforts to provide an adequate program, according to their light, and in keeping with their resources. It is believed also that there is much that each country may learn from the other, and it is hoped that some of the ideas presented in this article may make for a better mutual understanding.

[10] *Ibid.*, p. 121.

Is the Foundry Industry Important?

*Apprenticeship Committee, American Foundrymen's Association**

THE average citizen knows very little about the foundry industry; in fact, he is just barely conscious of its existence.

It is natural that he thinks most of those industries which sell him their products directly. He knows a little about the meat-packing industry because he buys beef and pork, he knows something about the baking industry because he buys bread and rolls, he knows something about the building industry because he lives in a house or apartment. He knows something about the light and power industry because he uses electric light every day and has electric washing machines, toasters, portable heaters, and even ranges which consume electric power. He knows something about retail merchandising because he constantly visits shops and department stores, and he knows something about the railway industry because he travels by railroad and may even receive an occasional shipment by railroad.

He reads popular magazines and newspapers and notices advertisements for radios, electric refrigerators, automobiles, shoes, shirts, cigars, cigarets, cosmetics, and a thousand-and-one other articles which are sold to him directly. Accordingly, he appreciates the industries which produce these things.

The foundry industry is one of those which does not ordinarily sell its product directly to the ultimate consumer. When the housekeeper goes on her daily or weekly shopping tour, she never includes a half dozen small gray-iron castings among her purchases. The average citizen sometimes buys castings directly in the form of hardware, but even then he does not buy them as castings nor does he ordinarily know that they are made in a foundry. The great bulk of the foundry product is sold to manufacturers to become part of machinery or tools, implements or furniture, or equipment of various kinds. The castings reach the ultimate consumer as a part of something else. Very few people who own and drive automobiles could point out on their automobile the parts which have been made by the casting process.

This attitude is reflected in vocational and trade schools. Seldom do the authorities of such institutions pay much attention to the foundry and foundry training. Few vocational schools in industrial communities have properly equipped foundry departments and teach founding as an important trade or occupation. We have visited many such schools. We have seen students at work in splendidly equipped machine shops, electrical laboratories, and plumbing and steamfitting departments. We have seen crowded rooms devoted to the teaching of bricklaying, carpentry, and masonry. But usually there was no foundry even in communities in which the casting of metals is an outstanding industry.

Strangest of all, we have visited vocational schools in which there were patternmaking departments with the finest machinery built and the best benches and tools obtainable and in which no foundry department had been established, despite the fact that the number of foundry men exceeds the number of patternmakers many times over and the patternmaking industry by its very nature depends upon the foundry industry and cannot exist without the foundry industry. In other words, in these schools there were excellent facilities for teaching an auxiliary trade while the primary trade upon which this auxiliary depends was completely overlooked.

It would be as reasonable for a man to build a garage if neither he nor any of his neighbors owned an automobile.

This more or less general assumption that the foundry industry is of little or no importance is a serious mistake, but the mistake would not be made if people could know how to identify the castings which they see every day. It has been said that it is impossible in a civilized community to get out of sight of a casting of some kind. At home, the ordinary citizen supplies heat by means of a furnace or boiler which is made largely of castings, the radiators usually are made of castings, essential parts of the wash machine and ringer in his laundry come from the foundry.

When he goes downtown, the citizen encounters brackets for street lights which are a foundry product. He passes catch basins, manhole rings and covers, joints for street-railway crossings, all of which were made in the foundry.

If he is employed in an office building he is hoisted to his work in an elevator which is made partly of castings and which is operated by machinery made of castings. If he is employed in a factory, he may operate a machine and if he investigates he will find that far more than half the weight of that machine is made up of castings. The frame or foundation of practically all machines is a casting and there is very little machinery which does not have other parts produced in the foundry.

The financial value of the product of the foundry industry is also an indication of the importance of the

**Personnel of the Committee:* Mr. S. M. Brah, Tri-City Mfg. Assn., Skinner Bldg., Moline, Ill.; Mr. G. E. Bergstrom, 228 Blackhawk Road, Riverside, Ill.; Mr. G. L. Coppage, Pusey & Jones Corp., Wilmington, Del.; Mr. C. J. Freund, The Falk Corp., Milwaukee, Wis.; Mr. John Grennan, University of Michigan, Ann Arbor, Mich.; Mr. F. W. Kirby, John Deere Spreader Works, East Moline, Ill.; Mr. R. E. Kennedy, American Foundrymen's Assn., 222 W. Adams St., Chicago, Ill.; Mr. John H. Ploehn, French & Hecht, Davenport, Iowa; Mr. W. F. Simon, Industrial Commission of Wisconsin, Madison, Wis.; Mr. G. P. Singer, Reading Steel Casting Co., Reading, Pa.

industry. Unfortunately, the money value of foundry products cannot readily be determined. The census of the United States and the biennial United States census of manufactures gives the value of foundry and machine-shop products as a single item. The proportion of the two industries in this division is not known.

However, a reasonable estimate of the value of foundry products can be made. The industry is divided into the steel-foundry industry, gray-iron industry, and aluminum and other nonferrous-foundry industries. The nonferrous industry includes the founding of all metals other than iron or steel. It so happens that the Steel Founders Society of America has made available various important data regarding the steel-foundry industry. In 1929, the steel-casting industry of the United States manufactured products valued at $205,436,000. Inasmuch as the value of the product of gray-iron foundries is considerably greater than the steel-foundry products, and the nonferrous foundries must also be included, the total casting industry of the United States undoubtedly produces no less than $500,000,000 worth, or a half-billion dollars worth of products in a good business year.

Even in this age of tremendous industrial development and million- and billion-dollar enterprises, a half-billion-dollar industry is a great industry, one of the greatest in the country, and hence, one of the most important.

There has been a great improvement in recent years both in the product of foundries and in the method of operating them. These improvements merit for our foundries recognition as an up-to-date industry. In recent years new foundries have been built in which cleanliness, ventilation, light, and favorable working conditions generally are all that could be expected by anyone. The application of electricity and compressed air to the industry for hoisting, ramming, and other operations has removed much of the hard labor. Many of the old foundries have been cleaned up and modernized and the worst of them have been closed because they were unable to compete and they now stand with sagging roofs and broken doors and windows, monuments to their own failure and inefficiency.

By perfection of the arts of melting and molding and particularly by technical research, the product of the foundry industry has been very much improved and has become sufficiently reliable to be classed without question as a high-grade, dependable material for engineering construction.

Individual foundry operators have paid much attention to the technical phases of foundry operation. Accurate instruments of many kinds have been introduced for the measurement of heat and of quantities of materials used, not only for the improvement of the quality of castings, but more particularly for the control of quality. Laboratories are almost invariably attached to foundries, and technical men conduct in them those experiments which are necessary in order to know the quality of the product and of the raw materials used in its manufacture.

A feature of the foundry business which has attracted many high-grade men is the great opportunity for progress in the industry. Modern methods in the foundry are comparatively new; great advancement has been made but still much greater advancement remains to be accomplished. In the machine shop and in other divisions of the mechanical manufacturing industries, processes and operations have been refined to such a degree that further development can be accomplished only by means of the greatest difficulty and the most intense study and application. In the foundry, conditions are different. The same effort applied to this industry will produce a relatively greater result.

To the tradesman and mechanic, the foundry in many respects holds a greater fascination than other industries. Much of this fascination arises from the quick judgment and alertness required of the foundry man. In the machine shop, for instance, when something goes wrong with a machine or a cutting tool, the machine is stopped and the mechanic, and perhaps his foreman and a repairman, examine the work at leisure and make the necessary repairs. When everything is safe and secure and has been examined and checked, the operation is cautiously resumed.

In the foundry it is much different. When a 30-ton open-hearth furnace has once been tapped and the molten metal has begun to run into the ladle, the stream cannot be stopped by any known means. If something goes wrong at this point, if a fuse or a motor on the ladle crane burns out, the foundry men in charge of the work must make important decisions and must take action quickly, before the metal hardens. Similarly, when a large casting is poured and the mold is found to be defective and begins to give way at some point or another, the foundry men must act instantly and correctly in order to save the mold and the metal. Every day in the foundry less serious emergencies arise which require less important decisions but require that they be made just as promptly.

These conditions appeal to men of energetic and semiadventurous dispositions who demand activity and comparative excitement. The foundry is a place for vigor and dynamic strength; only men with courage, initiative, high spirits, and enthusiasm need apply.

Because of the importance of the foundry industry on its own account, in comparison with other manufacturing industries of the United States, and also because of its importance as a great field of activity in which many different trades and occupations are exercised, we recommend the foundry industry to the attention of our American public-school authorities, particularly those in direct charge of vocational guidance and also those who are engaged in the field of vocational education.

We especially deplore the utter neglect of foundry instruction in the schools of those communities in which the casting of metals is an outstanding indus-

try. In those communities in which the casting of metals is the leading industry, foundry instruction should be given a greater emphasis in the schools than any other trade or occupation.

We feel that in the planning of school courses, in the selection of teachers, in the allotment of building space, and in the appropriation of funds for the purchase of material, equipment and machinery for the schools, the foundry industry should be given as great a share as its importance requires.

Teaching Aids for the General Shop

*Royal F. Jennings**

GENERAL-SHOP courses present the problem of teaching a large number of widely differing kinds of work at the same time. This may seem a discouraging problem when contrasted with courses where the class can be kept together. However, it is actually quite easily solved.

In the first place there are three teaching devices that will facilitate instruction greatly. One is the shop-knowledge notebook, another the objective test and the third, what we will call for want of a better term, a project board.

Before proceeding further let us consider the meaning of the term *general shop*. A general shop may be a general metal shop in which are a few each of forging, sheet-metal, and machine-shop tools. It may be a home-mechanics or farm-mechanics general shop in which will be found equipment necessary in teaching repairs and improvements about the home or farm. Or it may be a general electrical or general automotive shop in which are numerous kinds of equipment for widely differing jobs in the electrical or automotive fields.

The immediate purpose of any general-shop course is to make the students able to perform certain tasks well and to make them possessors of a certain fund of knowledge necessary or desirable in the performance of those tasks.

The doing and the knowing should not be divorced. A boy may be able to hook up a doorbell so it works, but should at the same time see in his mind's eye the flow of current with the resulting magnetic whirl around the wire, the building up of these whirls in the coils of the bell with the resulting north and south poles, the attraction of the armature and the breaking of the circuit. If he merely makes the bell work without understanding its operation, he has only handled the jewel box without knowing of the sparkling gems it contains. And this is where the notebook helps.

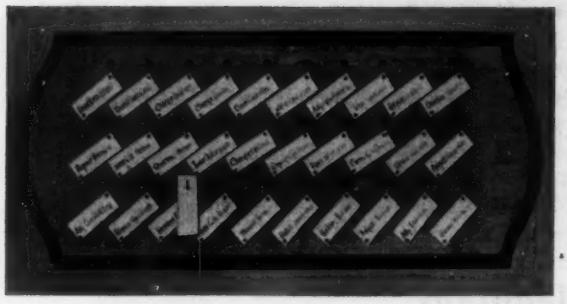
Every normal boy of school-shop age can keep a notebook. He will usually respond with a creditable piece of work, if he is led to understand that his notebook represents *him*, and that if he is a slovenly individual he will have a carelessly kept notebook, and if he is a good workman he will have a carefully kept book.

*South High School, Minneapolis, Minnesota.

The instructor, along with his demonstration, will usually make numerous diagrams on the blackboard, frequently bringing out certain points with the use of colored chalk. If he is showing how to connect a doorbell he will have occasion to indicate the current flow and magnetic effects by means of arrows. These diagrams should be quickly copied by the students on scratch paper and later, at home, put into the notebook, together with material dictated by the instructor. The notebooks should be handed in for a grade at least twice a month.

Another teaching help and timesaver is the objective test. Each project or job can have its own set of objective test questions. It is not necessary to have these typewritten. It is a simple task to write out, say ten true-false statements, five multiple-choice questions, and five or more of the completion type. When the time comes to give this quiz, two or three days after the demonstration and lecture to which it refers, the questions can be quickly written on the blackboard. All the pupil will have to do is to write *true* or *false* or a short statement or word after the number of the question on his paper. By the time the last question is written on the board the class will usually be nearly finished with the quiz. Fifteen or twenty minutes is all that need be consumed in a 20-question objective test. The questions can be so worded as to bring about some real thinking.

The notebook and objective test deal more directly with the shop-knowledge phase of instruction. The project board, however, is distinctly a project or job aid. This device simply consists of a drawing board with as many cup hooks screwed in it at regular intervals as there are shop projects or jobs in the course. Above or near each hook is a small card with the name of the project or job printed on it. Thus project, No. 1, may be labeled, "Wiring a Doorbell," "Replacing Faucet Gasket," "Patching an Inner Tube," or "Making a Tin Cup." When a student is given Job No. 1 he writes his name and the name of the job on a small tag and hangs it on hook No. 1. This is done by each student as a job is started. Shop equipment will determine how many students can work on the same job at one time. By using this plan the instructor can tell at a glance which apparatus and equipment is available for use, even though he may have a total of over a hundred jobs under way in all of his classes.



PROJECT BOARD USED IN THE AUTO SHOP

Another feature of the project board is that of a recordkeeping aid. As soon as a student has had a finished project approved by the instructor, he removes his tag and turns it over to the instructor who writes the grade for the project on it and slips it into his pocket for posting at a more convenient time.

The list of projects or jobs to be covered tends also to stimulate interest and speed up the activity in the shop. The untried problem offers a new challenge, and the total list, always in plain sight, creates a desire to complete all.

The same credit should not be given for all projects. A point system is useful in giving more credit for projects that take a longer time to complete. Thus, wiring a doorbell circuit may be worth three points, and wiring an automobile ignition system five points. A grade of "B" can carry one extra point, an "A" two, and a "D" minus one. The number of points a student has to his credit is therefore an index to what his shop performance grade should be. These scores can be ranked and the cases included between the first and third quartiles given a grade of "C."

In beginning a series of say twenty projects or jobs, it is well to have equipment enough for all students to start together on at least the beginning project and another at about the middle of the term. After the class is started off on a project that will take two or three days to complete, the beginning of the second and third days' shop time can be used to demonstrate two more jobs. As the fast students finish they can be assigned at once to one of the other jobs. In case it becomes necessary to assign projects that have not been demonstrated and explained previously, individual instruction will have to be resorted to. However, the instructor's time can be greatly conserved with the use of instruction sheets, shop manuals, and textbooks. A textbook for each pupil should, if possible, be used. A study table with reference books is also recommended.

Sample Objective Test for the General Automotive Shop

TIGHTENING CONNECTING-ROD BEARINGS

Name..... Date..... Period.....

Write True or False after each statement.

1. It is not necessary to put oil in the bearing before assembling as oil will immediately work into the bearing when the engine is started. ( )
2. The journals, the connecting rods work on, are always perfectly round. ( )
3. The rod cap should never be rapped after taking up a connecting-rod bearing. ( )
4. A newly tightened bearing should be very "stiff." ( )
5. The amount of play in a connecting-rod bearing can usually be detected by the push and pull method with a finger placed so it touches both rod cap and crankshaft. ( )
6. As the inside of the oil pan usually is clean, it is a waste of time to clean it. ( )
7. The rod cap should never be reversed. ( )
8. A connecting rod is easily bent. ( )
9. End play in a connecting-rod bearing should never be permitted. ( )
10. Oil fingers can face either way. ( )

Underline the words necessary to make a correct statement.

11. A bearing is tightened by (inserting shims) (removing shims).
12. Connecting-rod bearings should be taken up so (the crank can be turned only with considerable effort) (the crank can be turned readily with some drag present) (the crank will turn as easily as before starting the job).
13. A connecting rod should be assembled with (the cap on the same way it came off) (the rod facing the same way in the engine that it came out).
14. The connecting-rod bolts should be drawn up (as tightly as possible) (until the bearing begins to drag) (fairly tight).

Write in what you consider necessary to complete the statement.

15. If the connecting rods are not marked with numerals or punch marks, it is best to .....
16. If a bearing is burned out it is necessary to.....
17. To insure an oil-tight joint between the oil pan and the crankcase, it is best to.....
18. Connecting-rod nuts should be locked with.....
19. Rapping the rod cap is for the purpose of.....
20. A careless blow from a wrench or hammer on a crankshaft journal will cause.....

Psychology and Pedagogy of Woodworking in the Junior High School

*Stanley Mythaler**

THIS paper is divided into two parts — first, the psychology, and, second, the pedagogy of woodworking.

Psychology

The development of junior high schools within the past few years is bringing about a recognition of manual arts as a part of the general education program and not as a part of a specialized education.[1]

When the pupil enters the junior high school his sensory experiences are in the continual process of modification and development. This development may be easily continued and impressions corrected or modified by the experiences of the shop. Knowledge is best obtained through the combined training of all sense organs, or in other words teaching the same thing in several different ways. The eye may be trained to detect fine shades of color, strong points in construction or imperfections in work. The ear may be trained to perceive fine gradations of tone, the correct or incorrect functioning of machinery. The sense of touch may detect different materials, surfaces, etc. When a sense organ is stimulated an impression results in the brain known as "sense perception." In the brain a reaction takes place and an impulse is carried to the proper part of the body by a motor neuron. If similar stimuli produce the same reaction a number of times the action becomes reflex and has its reflex center in the spinal column. The fact that these connections once made are hard to break is of tremendous importance to education.[2]

Examples of fixed connections or reflexes are walking, driving a car, using a typewriter, and fundamental shop operations. Because of this, only correct habits should be formed by the pupil. It is to the advantage of man that many of his activities become reflexes. If this were not the case he would spend an hour dressing himself every morning and by the time he had eaten his breakfast the sun would be sinking on a day's work undone. Many of the fundamental operations of woodwork should be eliminated from consciousness as soon as possible and performed by means of the reflex arc. This will allow the thought to be directed to new and more difficult problems.

Woodworking is one of the oldest and most universal of human activities. The history of woodwork, whether expressed in architecture or furniture or other ways, is closely tied up with the history of civilization. Woodwork is a medium that lends itself readily to careful planning, close observation, accurate sense perception and the necessity of forming good judgments. The reaction on the individual from this must be decidedly beneficial. The pupils get their knowledge through individual experiences and see very definitely that success follows well-directed efforts, and failure is the result of inaccurate thinking and poor execution. The adolescent boy who is clumsy and awkward in his movements seems to find in woodworking a channel in which his movements may be satisfactorily directed. The gang spirit is developing and problems involving group work for the school or community fit into the program at this time.

Memory is the ability to retain knowledge. To make the sense impression and its retention as strong as possible, knowledge should be presented through several senses. If in teaching square measure in arithmetic, the hands, even the whole body assist in finding the area of a floor the fact will be more firmly fixed than if the problem is purely a mental one, or even one solved with the aid of pencil and paper.

The exercise of the mind is very dependent upon interest and attention. To most boys the working and finishing of wood is an interesting process and consequently the problem of attention in shopwork is negligible. The degree to which a pupil pays attention in woodwork is largely a matter of individual capacity. This attentive ability corresponds quite closely to the attentive ability in other subjects, but it is usually given voluntarily and without artificial aids in the shop. To secure satisfactory results in woodwork the decisions and judgments must be correct. If they are not, the mistakes are so apparent and disappointing that the pupil does more definite thinking in his succeeding work.

The tools and operations that require whole or body movements should be introduced first. Those that require finer muscular adjustments and more exacting manipulation should be given only after the simpler operations have been mastered. The work should be so organized that new thought-provoking problems are continually presented. The increasing of the size of the project does not necessarily mean a new problem. It seems to the writer that tool and material analysis and some of the theoretical work should follow the manual work of the problem. If the theoretical work is presented first it may mean but little to the boy because of his limited background of experiences in this new channel.

Pedagogy

Subject Matter. The problems given to the class should fulfill three requirements.

1. They should be capable of execution by the individual members. A grade boy beginning woodwork

*Grand Forks, North Dakota.

[1]Proffitt, *Industrial Education in 1924–26*, p. 4.

[2]Breitweiser, *Psychological Education*, p. 81.

should not be asked to work with hard wood or tools difficult to handle, such as the matching plane, etc. The problem should not require difficult joints, fitting, or finishing.

2. The work should be of such a nature that some planning is necessary on the part of the pupil. If the problem is a box 12 in. square, outside dimensions, to be made from ½-in. material, the pupil in planning his work would have to know that two pieces would be 11 in. in length, because these two fit between the two 12-in. sides.

3. The completed problem should serve some useful purpose about the home, on the playground or possibly to illustrate some correlated academic work. If the boy knows that the result of his thought and labor is going into the scrap box not much mental and physical effort will be given to it.

Interesting bits of history connected with tools and materials should be given occasionally. It requires but little instruction to teach the use of shellac varnish, but how much more interesting if the pupils are told this story: Shellac gum is obtained from the branches of certain trees in India, which myriads of small insects have pierced, allowing the sap to flow out and encyst them. The gum and insects are then stripped from the branches by natives who boil, strain, and dry the gum. It is then placed on the market in the form of dry crystals or powder and mixed with denatured alcohol for use.

Presentation of Work. The same problem may be assigned to the entire class, to groups within the class or the work may be entirely individual. The class method has the advantage of saving the instructor's time in preparation, getting supplies, and actual class teaching. If this method is followed for the second exercise the disadvantage is that the class is strung out like a string of race horses. Probably one of the most satisfactory methods is to divide the class into groups according to ability. The faster workers being held to a higher standard, doing harder problems, extra work or sometimes helping slower pupils. Individual teaching and problems is possible only with small groups. If attempted in a large class but little real teaching will be done and confusion will result. Probably no method of blue prints, job sheets, or text assignments will ever supplant the demonstration. "The necessity for the demonstration arises from the inadequacy of words to describe tool or machine processes, and from the inefficiency of trial-and-error methods of learning shop procedure."[3]

The instructor should guard against merely supplying materials, tools, drawings or models, and telling the pupil to "go to work." The state inspector of industrial arts in Minnesota recently made this statement, "In too many shops the students are working out their own salvation." The demonstration method is, of course, largely imitation for the pupil and the question might be asked, where is the problem? The tools are not easily set, they do not seem to work as they should and the desired results are not easily obtained. Every stroke of the saw, every blow of the hammer, nearly every movement is a new sensation and a problem in itself. For this reason the instructor should not give lengthy analytical discussions at this time. It is the thought of the writer that woodworking in the junior high school should have as its objective a general educational background rather than a specific training. For this reason the equipment should be such that a number of different industrial activities may be participated in by the pupil. Though this paper has to do only with woodworking, much that has been said will apply equally well to other junior-high-school shop activities.

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[3]Vaughn and Mays, *Content and Methods of the Industrial Arts.*

Utilizing the General Shop

Harold J. Davison and Earl L. Bedell***

BECAUSE of the variety of needs and interests of junior-high-school boys, it was found that the traditional unit shops were inadequate to house the courses to be offered for this group of boys. A room fitted as a general shop and having space and equipment for a number of different units was substituted for the old manual-training room with its equipment emphasizing woodworking only.

Courses for the junior-high-school boy, in Detroit, derive their names from their functions. Many of the courses are taught in a general shop but the name of the course is intended to indicate its content. The content is chosen so as to embrace the essential knowledge and skills needed by the handy man about the

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home and by the apprentice industrial worker, and also to include those social experiences which will develop good citizenship. As conceived in Detroit, the general shop is a room which contains the equipment for a number of various units. The general shop is a workroom which is equipped to take care of courses which demand a variety of work situations. There are no courses, in Detroit, designated as general-shop courses, but there are definite courses which utilize the facilities of a general shop.

For example, the household-mechanics course strives to give the boy some knowledge and to develop certain basic skills which may be immediately applied. Present practical values, rather than the deferred values are emphasized. The boy's interest does not have to be stimulated by setting up artificial situations. The classroom conditions are studied so as to create a situation similar to that found in industry or the home. Very few projects are made in the junior-high-school shops which involve complex operations.

Every seventh-grade boy, irrespective of his future occupation, who is attending the Detroit schools must take this household-mechanics course. Consequently, it has as its major objectives the development of handy-man abilities and social efficiency of value to all persons irrespective of their future occupation or profession.

Pupil Management

Large classes necessitate an organized pupil personnel. The organization develops social efficiency, one of the most important characteristics of good citizenship. If ability to live congenially among one's fellows is accepted as a worthy major objective of our schools, the obtaining of one's education as a member of a well-organized group may easily be of more real value than any other outcomes of the course.

The boy, by first being a follower and then a director and, in turn, a follower again, is learning and developing those qualities — the acquisition of which *is* socialization. He is acquiring those characteristics not by digesting additional subject matter, but by actually participating in a social organization and reaping his just desserts according to his social or antisocial actions.

In the junior high schools of Detroit will be found classes in which students are attending to many of the routine duties which are usually performed by the teacher, but which are not basically instructional in their nature.

This pupil personnel organization consists of a superintendent, a number of foremen, a safety engineer, a record clerk, and tool- and stockroom attendants.

When properly functioning, this organization — with but little supervision by the teacher — takes care of all the details of class management. The teacher, being thus relieved of the usual routine duties, can devote his entire time to demonstrations and individual instruction. The teacher is thus able to find time to give the necessary individual instruction or to devise ways and means whereby his course may be enriched to the ultimate benefit of his students.

(To be followed by an article on Pupil Personnel organization.)

The Vocational Instructor's Plan Book

*J. Henry Holloway**

THE well-prepared plan book is to the instructor what the blue print is to the builder, or the compass to the mariner. It directs him toward a goal and contributes toward precision in his effort to accomplish a desired purpose. In every type of school some kind of plan is necessary if instruction is to function in learning.

The form that the plan takes varies with the kind and grade of school, the character of instruction, and the demands of the supervisor.

There is often a feeling on the part of the teacher that preparation of work outside school hours is an unjust demand upon his time and, because of the so-called imposition, the plan is prepared half-heartedly and in the least time that will suffice to get the supervisor's approval. A teacher who follows this line of reasoning fails to understand that a plan well worked out will, during the instruction period, relieve him of the strain and worry of selecting instructional content at a moment's notice, and it furthermore removes the concern of depending at the moment for an inspiration which may not come. Nervous strain and resulting fatigue are due in part to failure at the beginning of the period to know just what is to be undertaken in the matter of instruction.

The instructor who comes to the new day with his work already laid out, prepared to teach a series of lessons carefully planned beforehand, experiences a confidence of success that makes his teaching easier and creates for the students an atmosphere of reassurance, expectation, and satisfaction.

When the reasons for the plan book are understood, it is prepared more willingly and more successfully. To the instructor, the principal value of the plan book perhaps lies in the fact that when the work has been previously planned, he is left free to give his whole attention to teaching. The two operations, the planning of the work and the carrying out of the plan, should be kept separate. Mediocre teaching results very often because the two processes are not kept apart.

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The following outline of a lesson in English gives every evidence of what is useless as an instructor's guide. The time taken in writing it was wasted.

Week of———————— English
First Period
Oral exercises in word division.
Second Period
Introductory lesson on proofreader's marks.
Third Period
Twenty-five spelling words.
Written exercise in word division.
Written summary of work in proofreading.
(Signed by Instructor)

Such a plan does not limit the instructor to a definite procedure and does not prevent him from digressing. When the teacher knows that a predetermined block of content matter will consume a whole time unit, he also knows that he must keep to his subject. He will not wander off into byways, and consequently, when he wishes in the future to take account of his progress and to determine how far he has completed the course of study, his plan book will aid him.

If the plan is to be cumulative, showing class progress in the course of study from the beginning of the term, it should be kept in a book. The loose-leaf arrangement will commend itself, since by this means the loss of individual papers when not bound will be avoided on the one hand, while on the other, the possibility of substituting a new outline for any instruction unit will be possible by withdrawing one sheet and inserting another to take its place.

In preparing each unit of instruction, the teacher must keep in mind the demands of the course of study, the point in that course which is to be covered by the present effort, and the amount of time to be given to each subject in the time unit allowed.

The experienced teacher finds that his plan needs constant change and revision as does the course of study on which it is based. The nonprogressive instructor neglects to date his teaching plan sheets so that he may use them over and over.

The Plan Book Used as a Progress Book

The plan book may become a record of progress by the simple device of crossing out what has not been accomplished and by checking what has been covered.

No outline, however well prepared, will go over 100 per cent. Failure in this respect should not be a source of discouragement to the instructor, nor should it be an excuse for lack of preparation. Interruptions will occur in the teaching period; instruction will at times be delayed for good and sufficient reasons, and sometimes for poor reasons. The outline as prepared must not anticipate interference with the teaching process, but when the break occurs, it should be noted as part of the record.

To the supervisor, the instructor's plan also has values. Only two of these will be considered here. Since the principal or the superintendent may have little opportunity to visit the instructor, they must depend upon the teacher's plan for information as to lesson preparation and class progress in accomplishing prescribed courses of study. The quality of the teacher's planning will also be a guide to improvement in technique, for the supervisor will be able to read more than mere plan of work in the teacher's outlines. The second value to the supervisor is one that the instructor should keep in mind since it will serve as a help in determining how detailed the outline should be. Is the plan so detailed that a substitute can continue the teaching when the instructor is absent?

Preparation Makes Teaching Easier

The following lesson outline in linotype operating shows many of the desirable characteristics of the instructor's plan. If the instructor were absent, a substitute qualified to teach the subject could take up the work with the outline as given. The following facts should be considered in evaluating this instructor's effort. In his class, individual job instruction sheets are used in machine operating; a different group of students reports for instruction each day; the only group or mass teaching during this one week is that represented by his plan here given. The outline contains an instruction content which will be required by every student as he progresses in the work, and is given therefore throughout the week. The demonstration-development method is used. If the teacher had to give a number of group lessons during the week, his weekly plan would be the set of outlines prepared for these lessons.

There is danger in suggesting that the plan book need not be followed to the letter. Yet, when the lessons for the week are being prepared, the instructor will think of certain approaches, motives, items of preparation and presentation, and when the time comes to teach the lesson, better illustrations, other items, and new ideas will present themselves. Naturally these should be employed. When this occurs, the instructor should indicate the changes on his plan.

The purpose of the plan is not, as some think, to present an object of art and beauty, but rather to have at hand a flexible, changeable outline which in the mind of the experienced supervisor is beautiful only because it is usable, and becomes a means of more efficient instruction. A plan book is not an end in itself.

Individual Instruction Sheets Are a Shop Teacher's Plan

In vocational education are found conditions which should be taken into account in preparing the plan. In the school shop, the instructor who uses individual lesson sheets and whose pupils progress as rapidly as their individual effort and proficiency allow, will need to plan for that part of the work only which covers mass or group instruction of an oral nature. When in a shop of 24 pupils, fifteen different jobs are being done at one time by the students, and when these jobs are outlined on job instruction sheets, there is neither need nor possibility of preparing a separate composite plan. The type of instruction precludes this. But if,

CENTRAL PRINTING TRADES CONTINUATION SCHOOL
SCHOOL FOR MACHINE TRAINING
Instructor's Lesson Plan
Burt F. Tomlinson, Instructor
Date_____

Trade: Linotype Operating.
Subject: Set Cut-In Side Heads.
Equipment: Machine, Copy, and Miller Saw.
Instructor's Aim: To familiarize the student with setting a new style of heading, called the "cut-in" side head.
Student's Aim: To set editorial page heads.
Lesson Approach — Motivation: Ask the students if they have not read editorials and magazine articles containing side heads. Recall instances when they have seen them used in advertisements. Show specimens of side heads.
Preparation: Students have had experience in setting other types of headings and the trend of thought is carried forward by a class discussion, conducted by the instructor, to include the cut-in side head.
Precautions for Students:
1. When indenting, do not change ejector by using vise jaw.
2. Check the settings of scales before starting to operate.
3. See that the guard is over the saw blade before using the Miller saw.

Demonstration by Instructor who
a) Sets an example of copy requiring use of a cut-in side head.
b) Takes it to the saw, cutting both heading and matter to the proper measure.
c) Places the heading and body matter together on a galley.
d) Emphasizes while demonstrating, safety precautions noted in the step of *Preparation.*

Application by Students:
a) Select students with some background of experience and repeat the operations, using the following plan:
1. Student sets heading first, leaving sufficient space for sawing.
2. He measures the longest line of the heading, then indents the proper number of lines to be cut off by using em spaces or the left-hand vise jaw.
3. He takes the lines to the saw, cutting the heading first.
4. He then saws the indented lines, leaving one em on each for space.
5. He puts the heading and the text together.
6. He pulls a proof of the job and turns it in to the instructor.

Testing:
1. Instructor reads and marks proof for errors and returns it to the student.
b) Other students perform the operations similarly.

Questions to Students:
1. What is the difference between a cut-in side head and other types of headings?
2. Where are side heads used?
3. Why is an additional line required of indented composition?

Questions by Students:

LESSON OUTLINE FOR LINOTYPE OPERATING

in the same shop, a periodic shop talk is given to a group or to the entire class, this instruction should be shown in a plan book.

If, in the related workroom, group instruction is resorted to, the plan book must be prepared to provide for the needs of each group, and there will be as many plans as there are groups, plus the number of lessons given to each group. When mass instruction is given to the entire class, the problem is simple.

Whichever form the plan book takes, considering the possibility of a loose-leaf or a permanently bound book, considering the number of groups to be provided for, considering further the extent to which the individual job instruction sheets may be justly claimed to be a substitute for part of the instructor's plan book, there are definite items that every plan should include. Among these are appropriate headings such as the subject, the date and the instructor's name. The reasons are evident.

The Plan is the Instructor's Time-Table

The plan also should be the instructor's time-table. When he places before each lesson the time for beginning and ending, he is checked from extending the lesson time beyond that allowed. Even with the time-table, he may transgress time limits; nevertheless, the inclusion of the time on the plan will aid as a guide.

Titles, authors and pages of reference used in preparing the lesson should be indicated. These will be useful when the teacher needs to clear up some point that has been questioned, either by a student or by himself, or when he wants to use the same material for future lessons or revisions.

A marginal note should show the part of the course of study accounted for by the lesson. This is useful for the reason that it is sometimes found desirable to include a lesson in the plan when the lesson is out of sequence in considering the arrangement as given in the course of study. The notation will remind the instructor that the course, as far as the lesson applies, has been covered, and the note will be useful in checking progress later.

Too Many Details Defeat the Purpose

The most important consideration is that of detail. How complete must the outline be? Within certain limits the answer will depend upon the individual interest, progressiveness, and ambition of the instructor on one hand, and the viewpoint, understanding and possibly some eccentricity of principal or superintendent on the other. There should be sufficient detail to enable another to take the plan and teach the lesson without great loss to the student, and without causing a break in the continuity of what has been taught before. When many subjects are to be covered, the instruction time will be shorter and therefore the lesson

outline will necessarily be briefer. When more time can be given a lesson, the outline should contain more.

Not every detail need be given. In fact, to jot down every incident works a disadvantage, in that this tends to hold the instructor's attention on the plan, as a lecture written out holds the lecturer's attention to the reading desk rather than on his audience. The lesson outlines should consist of a series of points, around which the instructor can, at a glance, mass the instructional content.

The Method of Instruction is Revealed in a Good Plan

The plan should give some indication as to the method to be employed in putting the lesson over. The type of lesson will suggest the outline. If a development lesson is to be given, the headings commonly accepted as best suited to this type of instruction will be used. If a drill lesson, a testing lesson, an appreciation lesson, an information lesson, whatever the type of lesson, the method of instruction should be clearly and definitely indicated.

In vocational education, much time has been spent in the development of individual instruction sheets for the students. The sheet is a lesson plan placed in the hands of the student, and it is so simply prepared that the student mind can, with minimum help from the teacher, master the content with least time and effort.

If the individual job sheet is best suited as a teaching device where individual instruction is given, the adaptation of the same device offers the form for outlining mass instruction. The only differences between the two types of teaching are: One student is taught the lesson in one instance while a group or all are taught the lesson in the other. In one instance, the student uses a job card and reads the instruction, while in the other, he follows the teacher and learns, not from the card, but from the instructor directly. In both cases, the method of instruction may be the same, and to this end the teacher's plan does not differ greatly from the student's job instruction sheet. In teacher-training courses, the preparation of student job instruction sheets has received well-deserved attention with resulting improvement in the preparation of these by instructors. However, but little attention has been paid the teacher's plan in vocational instruction.

The Individual Job Instruction Sheet Serves as an Example

There is a technique of lesson planning in one of its aspects which has yet to show the same good result as has been produced in the preparation of job sheets. When the plan book of the vocational instructor gives evidence of care, painstaking effort, and application of scientific principles, it will not be unlike a series of instruction sheets. One of these will be prepared for each of the week's lessons, and when placed in the binder will together make up the week's work. This will be repeated week by week until the course is covered and the year's work accomplished. During the first year there must necessarily be considerable preparation, but if it is well done, the future planning of the same lessons will consist of revision based on the instructor's increasing efficiency, changes in the course of study, more recently acquired knowledge, and progress in science and industry.

Ways and Means

*William A. De Vette**

RECENTLY a small group of students at our school organized a club for the purpose of building and flying all types of model aircraft. The members soon discovered that they could use considerably more money for parts than they could realize from the dues that were paid. In looking around for ways of increasing the club funds the following idea was unearthed and the club is now passing it on to other clubs whose members are readers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

It was found that by taking a letter, such as is shown in Figure 1, and compressing it horizontally and extending it vertically it becomes practically unreadable unless the letter is looked at from the end and the surface of the paper nearly in line with the eye. Using this idea we made up some cards such as the one shown in Figure 2. As at first seen it is almost undecipherable but when held so that the eye is almost in line with the surface, thus recompressing the letters vertically, a name becomes readily readable.

A little experimentation showed that a line through the top and bottom of the letters improved the appearance and did not impair the legibility.

Figure 3 was similarly developed and from it Figures 4 and 5, each a little more complicated than the preceding one.

With a little practice each boy was able to make his own.

The members then agreed upon rates for the various types and proceeded to take orders. It was in most cases merely necessary to show the card to another pupil or teacher, and take his or her personal order.

A little work each afternoon after school soon sufficed to put enough money in the treasury for several planes, and the boys know how to get more when the need arises.

Figure 6 is added to help those who are just beginning to make neat letters.

It is probably unnecessary to state that puzzle cards which are to be sold should be made on fairly stiff smooth-surface paper, such as bristol board, and that all pencil marks should be carefully cleaned off.

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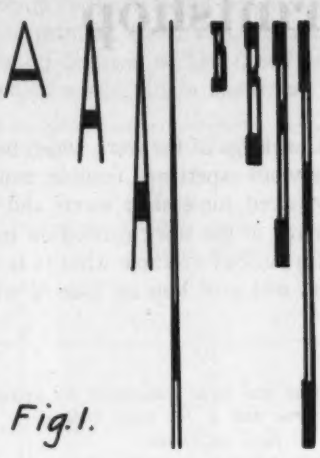

Fig. 1.

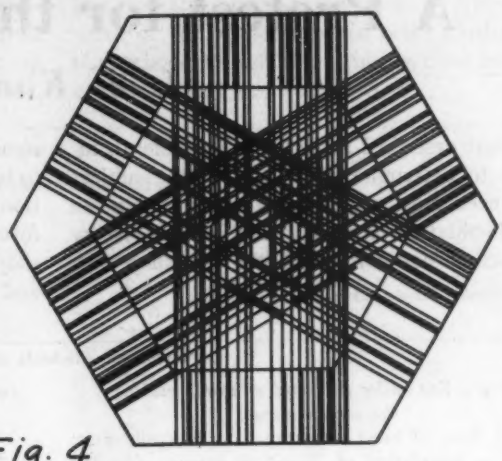

Fig. 4

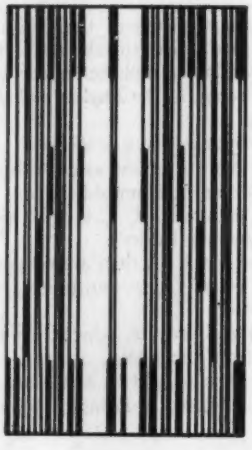

Fig. 2

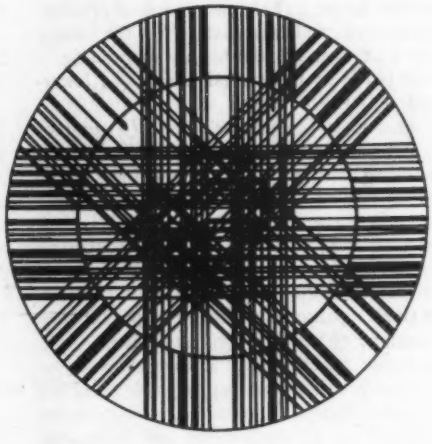

Fig. 5.

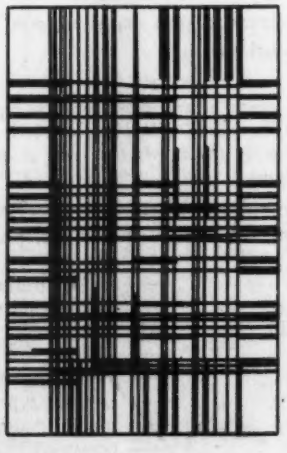

Fig. 3.

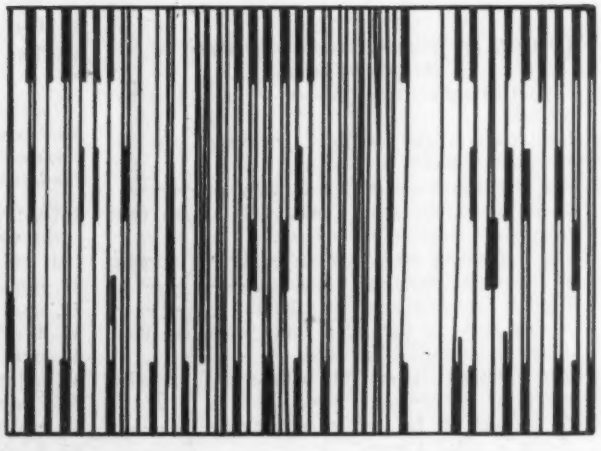

Fig. 6.

A Pretest for the Printshop

*L. W. Kunkle**

THE pretest described herewith will enable an instructor to determine what part of the subject matter will need most emphasis. It will give him an idea of the foundation on which he is to build. Every junior-high-school boy comes into the printshop with some general knowledge of the work which he is about to begin. By previous experience, reading, and observation he has acquired some shop terms and some information relative to the work carried on in the new shop. He is also curious to know what it is all about and the pretest will give him an idea of what he is

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Pretest for Students of Printing

Draw a line under the word or words making the sentence true.

1. The thing of most importance to the printer is: (*a*) a knowledge of historical events; (*b*) the proper use of good English and punctuation; (*c*) the ability to speak well in public.
2. In order that the printer be able to do the best work, he must know: (*a*) the proper use of printers' tools, equipment and material; (*b*) the wages earned by a printer; (*c*) the history of printing.
3. This letter (e) is a: (*a*) capital letter; (*b*) lower-case letter; (*c*) Gothic letter.
4. The em quad is a: (*a*) printer's tool; (*b*) unit of spacing; (*c*) part of the printing press.
5. The composing stick is a: (*a*) device for shifting belts; (*b*) printer's tool in which he sets type; (*c*) graduated measuring tool.
6. The proper position of a printer while setting type is: (*a*) standing erect on both feet; (*b*) sitting on a high stool; (*c*) resting the body against the case.
7. For the greater pause in thought the printer uses a: (*a*) comma; (*b*) period; (*c*) semicolon.
8. Printing should be chosen as a lifework because: (*a*) the printer earns good wages; (*b*) there are plenty of printshops; (*c*) printing appeals to many (the student, as a worth-while and interesting livelihood within my abilities).
9. It is necessary to know the case layout well, in order to: (*a*) do the best work; (*b*) get a high mark; (*c*) spell credit.
10. The best paper is made from (*a*) rags; (*b*) wood; (*c*) straw.

Complete the following sentences by supplying the missing word.

11. Capital letters are called ———— by the printer.
12. Ligatures are two or three characters cast on ———— bodies of type.
13. The first line of a paragraph is always ————.
14. Type as well as printed matter is always read from ———— to ————.
15. The impression made from type for the purpose of discovering mistakes is called the ————.
16. Bond is the name given to a kind of ————.
17. A type form or part of a form which has been mixed up or confused is called ————.
18. The printer's system of measurement is also called the ———— system.
19. A package of flat paper containing ———— sheets is called a ream.
20. Man's progress has been made more rapid because of ————.

Indicate the true and false statements by writing T for true and F for false before each statement.

21. The California job case is a shallow case for the storing of type in an orderly manner.
22. The California job case is the only type case the printer uses.
23. Some of the compartments of the California job case are larger than others to take up more room.
24. The widest letter in the alphabet is the letter W.
25. The last letters added to the English alphabet were the letters j and u.
26. The printer's unit of measure is the inch.
27. All type characters are of the same width.
28. Gutenberg made the first movable type.
29. The lower-case letters b, d, f, h, k, l, and t are ascenders or ascending letters.
30. A two-point lead is thicker than a six-point slug.
31. The lower-case letters g, j, p, and y are descenders or descending letters.
32. A galley is a metal tray on which to place type when removed from the stick.
33. The composing stick is held in either hand.
34. Size of type is indicated in terms of points rather than inches.
35. Type is an alloy (a compound) of lead, tin, antimony, and copper.
36. Hand composition is done by machines.
37. All lines of type in a single paragraph composition are the same length.
38. When filling in with spaces and quads, the larger ones should be placed at the outside.
39. It is not necessary to keep spaces uniform.
40. Two leads equal one slug.

Indicate what words or group of words in the right-hand column are associated with those in the left-hand column by numbering the words the same as those in the left-hand column.

EXAMPLE: Type is associated with printers and as the word *printers* is No. 41 in the list, place No. 41 before the word *type*.

41. printers	—— famous printer
42. quad	—— composition of type
43. Benj. Franklin	–41– type
44. pica	—— lock-up
45. impression	—— machine-set type
46. chase	—— case for type
47. brayer	—— spacing material
48. linotype	—— presswork
49. form	—— proof press
50. California job case	—— unit of measure

about to work on. The test shown herewith was given to 49 students on the first and last day of their attendance in the printing class. The test was not given in the printshop because of the descriptive matter on display which would aid in answering the questions. The scores made by each student on the first and the last day are shown in the table.

All of the students tested were ninth-year junior-high-school pupils. This printing class met 1½ hours a week for eighteen weeks.

Table Showing Scores Made

Students	*First Score Items Missed*	*Second Score Items Missed*	*Students*	*First Score Items Missed*	*Second Score Items Missed*
A.B.	20	13	R.L.	28	14
A.R.	27	11	A.W.	28	13
R.B.	23	10	W.R.	20	9
J.S.	23	4	L.B.	15	11
B.G.	19	9	F.R.	26	15
H.S.	24	16	C.L.	30	21
E.H.	20	4	E.S.	33	9
D.P.	20	11	C.S.	30	13
D.S.	23	7	H.F.	30	20
J.R.	19	14	J.B.	28	13
A.T.	25	12	C.R.S.	21	13
F.W.	21	12	C.Y.	27	13
C.D.	18	12	J.K.	24	8
F.G.	32	13	H.C.	27	19
J.J.	29	16	W.W.	23	9
C.K.	26	14	H.J.	32	15
H.M.	29	10	F.Mc.	22	10
R.M.	34	21	W.M.	12	3
H.F.	23	12	E.P.	25	13
H.Mc.	26	19	M.W.	20	8
J.W.	31	12	R.K.	24	13
N.W.	20	7	H.B.	12	5
R.Be.	20	9	H.I.	31	20
W.D.	26	6	A.F.	21	12
F.H.	25	12			

Table Showing Items Missed

Items	*Times missed*		*Items*	*Times missed*	
	First time	*Second time*		*First time*	*Second time*
1	2	0	26	28	10
2	15	10	27	17	4
3	26	2	28	15	9
4	18	2	29	18	14
5	16	3	30	19	9
6	17	3	31	14	15
7	30	15	32	13	2
8	16	8	33	8	2
9	18	15	34	9	3
10	23	19	35	14	9
11	47	16	36	13	8
12	48	20	37	24	16
13	12	3	38	24	6
14	33	23	39	14	14
15	38	10	40	30	32
16	43	23	41	1	0
17	46	19	42	39	24
18	47	26	43	15	9
19	45	19	44	36	23
20	13	4	45	29	13
21	6	3	46	22	2
22	10	7	47	38	7
23	13	7	48	42	35
24	13	12	49	47	36
25	20	6	50	35	6

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

SHOW OUR USEFULNESS

A certain full-time vocational machine-shop teacher was proudly exhibiting the work of his best student. The project, which consisted of parts made of various metals, was beautifully finished. So accurately were the individual pieces machined that they would snugly fit together at a temperature of 70 deg. F. A rise of temperature, however, would make their assembly impossible, because of the expansion of the individual pieces.

As already stated, the work was marvelously done. The finished product really might be compared to the so-called "Meisterstück" which was exacted of the guild apprentice in Germany before he was permitted to leave his master as a journeyman.

Looking at the project, one was at first carried away with admiration for the fine finish and the beautiful and accurate workmanship. It was evident that hours and hours of loving labor had been put into the work. A little reflection, however, made one wonder what the project was good for, now that it had been completed. It recalled to one's mind examples of other time-consuming jobs, which, when finished, represented nothing of any particular value. In a sense it might be compared to some of the weird articles that are found in some homes, to which the owner points with pride while he informs the visitor, "Yes, this model of the Cologne cathedral is composed of 65,347 separate pieces of cork, burnt match ends, and citrus fruit crates. It took me 15 years to collect the material and put it together, and I spent practically every evening, Saturday afternoon, and Sunday during those years on the job."

This is not written to belittle the fine piece of work that the boy in the machine shop of that full-time vocational school produced. Far from it. It required the skill of a better-than-average mechanic to do the job that the boy had undertaken and completed. The question that might be legitimately asked, however, is, "Was that time as well invested and as wisely spent as it might have been? Could not that same painstaking effort have been put into something that would have been useful after the job was completed? Probably into a special tool that the boy could carry along and use the rest of his life — provided he wanted to spend that life at the trade which he was learning."

The same degree of accuracy and workmanship, spread over the time spent on making the project which that teacher displayed with such pride, would have produced a sine bar, an internal and external standard cylindrical taper gauge, a set of taper parallel gauges, or the like. Any one of these would have been just as valuable an example of skill as the project described in the foregoing, but it also would have possessed a permanent, practical value. It would have been something that could function in the life of the student.

There is no doubt that the boy who produced the piece of work which the teacher showed to the visitors, was interested in what he produced. Neither is there any doubt that valuable scientific principles were involved in its design and construction, but all these factors could be found in one or all of the few examples of utilitarian projects mentioned. In other words, choosing a job that can actually be used for something after it has been completed, adds to the appeal factors of challenge and interest the further factor of usefulness, thus making the project just that much more valuable as a teaching problem.

Furthermore, the utilitarian problems come much nearer in instilling a real respect for accuracy and workmanship, because the necessity of these are brought out by the service which the finished piece is to render. In the merely show type of project, however, the need of accuracy depends upon factors, which in the mind of the boy are more or less abstract.

By choosing the latter type of project the teacher not only ignores the factor of usefulness that might have been injected, but adds on himself the extra burden of personally making the application of theory to practice, or at least checking back to see whether the student has done so himself.

SALARIES AND RESPONSIBILITIES

In this period of unrest with many taxpayers anxiously figuring out just how to raise enough money to pay their taxes, school expenditures naturally come in for closer scrutiny and frequently for adverse criticism.

In cities where the school systems have been able to maintain teachers' salaries on former levels, voices are generally heard that teachers, too, must take their cut. Deplorable as this viewpoint may be, nevertheless it has to be faced. The fact that these critics did not urge salary increases for teachers during the time of prosperity and plenty, may be censored, but this does not enter into the question.

Unwise and indefensible as these reductions in teachers' salaries are, even when retrenchment in other lines is advisable, it is quite certain that many teachers will be confronted with the necessity of taking reductions. This means that readjustments will have to be made, more careful budgeting resorted to, and some of the expenditures made for things that have hitherto been accepted as necessities will have to be curtailed or even dropped.

The necessary changes to accommodate one's life to a reduced income, however, must be made in a philosophical and professional manner. Teachers must not allow school activities to falter in an effort to adjust working time to salary. The profession of the teacher is on such a plane that more is expected from him in the way of assuming civic responsibility than from any other body of men — and the teacher, if he is true

to his calling, lives up to this expectation even if he must make personal sacrifices.

TEACHING IN THE EVENING SCHOOL

The present depression has brought home very distinctly to many that further education is not only something that might be beneficial, but something which is necessary for advancement in the fields of industry, commerce, and agriculture. It is a far cry from the first attempts at operating evening school when only the ambitious could be interested to the point where they enrolled, down to the present day where stern necessity causes so many adults to apply, that most evening schools carry numerous applicants on the waiting list, who hope that they may have the good fortune to be called in for even a small portion of the school term.

To teach evening-school students is a distinct privilege. These students, on the whole, are very earnest-minded people who have learned in the school of experience that they have not been as well equipped as they should be. Most of them quite frankly admit that the reason for their failure to measure up to modern requirements is largely due to their own short-sightedness in the past, and that they are returning to school with high expectations.

The evening-school teacher, therefore, has the advantage of having willing students, adults for the most part, who need not be coerced into following schoolroom routine. The very feeling of optimistic expectancy that brings these men and women to the evening classes, however, may be their undoing unless the teacher carefully yet tactfully brings home the idea to them, that there is more to evening-school work than merely deciding to attend.

Many of these students, carried forward by the resolve to do, very quickly find out that real sacrifices are demanded of him who would succeed. After the first week of attendance many find out that education still demands the laborious plodding that made it distasteful in their youth. It is with these students that the evening-school teacher will need to work hardest. It is they who must be forever urged forward by the instructors' enthusiasm. It is they who must be continually reminded of the goal which they themselves have set.

Because the evening-school classes are recruited from such a variety of sources, and since attendance and entry into class may be influenced by so many different factors, the instructor must have his instructional material so arranged that most of it can be used by the student without much help from the teacher. This material must be carefully assembled in progressive lessons so that each step represents definite progress without being too easy or too difficult for the average student. The teacher must not, however, rely too much on the individual instruction sheets. At least once each evening he must get his entire class together on some problem of common interest. Unless this is done, the work may become too mechanical and tiresome to some of the weaker pupils who need more than the printed page to remain interested.

Besides the student whose lagging interest must be continually pepped up, the teacher has another person that needs his attention, and that is the overambitious student who wants to enroll for courses that will take up five evenings each week. This type, too, needs diplomatic treatment. Such students must be shown that undue haste does not mean progress; on the contrary, that it may really spell defeat. They must be reminded that an overtrained athlete is as poorly prepared as one who has neglected his training. Only the exceptional student can successfully carry four evenings, while the average has a load sufficiently heavy with two or three evenings.

With regard to the standards of accomplishment for evening-school students, these, too, must be decided after the teacher has studied the individual student. The instructor must remember that many of those who are attending his classes may be out of school for many years. They are usually very sensitive and the teacher's biggest job is to break down their reticence and get them to admit what they do not understand.

With proper sympathy, a thoroughly trained teacher will find that his evening-school students, in the main, will be his greatest inspiration, and that the work which he accomplishes with them will be some of the most satisfying of his teaching experiences.

THE RELATED SUBJECTS

More and more shop teachers are coming to the realization that their work at school is only partly done when they have instructed their students in the *how* of their subject. The *why* part of shop teaching is assuming larger and larger proportions, as the real objectives of industrial-arts and vocational education are being better understood and more fully realized.

Some teachers have difficulty in deciding just what is meant by the term "related subjects." They are of the opinion that since science or mathematics enters into the work which they are teaching, general mathematics or general science will satisfy the requirements of their students. This, however, is not what is understood by the term "related subjects." The subject matter introduced under this name must specifically belong to the work that is being taught in the shop. The mathematics must be that used on the job. It must be directly — not remotely related. In the same way with the science work. The lever for the student in the auto-mechanics shop is not an abstract lever of the first, or second, or third class, but a brake pedal, a clutch fork, and so on.

The teacher who has had little practical experience, no matter how skillful he may be in the shop, usually has trouble in making his related work as specific as it should be. He will always be tempted to make it too general. Frequent visits to industrial plants, and friendly discussions with mechanics, foremen, and others will, however, assist him in making the proper choice so that this part of his work with his pupils may become as practical and as efficient as his shop-work.

Centrifugal Pump

*August Flam**

THERE is a definite point in the development of the drafting student when material of the desirable sort for his needs is difficult to find. To be sure, there are many possible problems he might work on, but he has a peculiar inexplicable notion that he is interested in *something more difficult, and different* from the regular work. As one student aptly put it, he desired a sketch or drawing to work from, which "gives enough information so that I can get the idea, and yet not so much as to spoil the problem for me." It was with this thought in mind that the drawing of the centrifugal pump was prepared. (See Supplement No. 224.)

It is not easy to state just where this problem can best be worked in, since students differ very greatly in ability, ambition, and initiative, and while some students have been very successful with such problems at the end of the second year of drafting, there are undoubtedly many who would be unable to do much with them even after three years of preliminary training.

The problem shown herewith consists of laying out the pump, full size, preparatory to detailing every piece. In a way, it practically amounts to designing. The student should be required to adhere to the few dimensions given, and with the aid of handbooks, his own past experience, and possibly some help from the instructor, make the entire machine with sufficient views and sections to enable the detailer to work from the layout.

After the layout has been satisfactorily completed, careful detail drawings should be made of every piece. Actual drafting-room conditions, may be approximated by assigning the details to the various members of the class. If this is done, the layout man may be appointed squad boss, and be held responsible for the checking. To do this properly, he may be assigned the task of making a check assembly drawing from the details as they come in. It is possible by this method to assign the same problem to several students, and have each one produce his own interpretation, using, of course, the same full-sized layout for the dimensions. The layout man himself may detail some of the more difficult pieces, or else they may be assigned to the more advanced students in the class. There is sufficient material on this pump problem to take care of the needs of the weakest and strongest students in the class. The assignment drives home to the students the close coöperation that must exist between the members of an efficient drafting force. It illustrates the rôle and function of designer, detailer, checker, and tracer in their various relationships to each other, and the relative importance of each. For the drafting student who is bent on getting into industry as a draftsman, no better preliminary training can be desired.

The pump itself consists of a cast-iron housing, having the 4-in. and 6-in. openings detailed to fit standard flanges. The impeller has four vanes, and is mounted on a cold-rolled steel shaft and secured by means of a key. It is desirable to look up "impeller design" in a good handbook, before deciding on the details. Twelve studs fasten the housing to the flat disk functioning as the back of the casing. This disk also carries the opening at the top, kept closed by means of a hinged cover. It may be desirable to provide a drain plug for this oil container. No such plug is shown on the attached assembly. Further along on the shaft is an 8-in. pulley, which may be designed in a variety of ways, to suit individual tastes. At the right is the end bearing. This bearing is babbitted, and is provided with an oil reservoir with oil ring; also filler and drain plugs. The bearing is made with a removable cap, and terminates at its base in a flat pad, by means of which it is fastened to the bedplate. The bedplate is provided with bosses shown in the right end view, for the purpose of fastening the entire mechanism to a solid foundation. At the end of the shaft, and fastened to it by means of a headless setscrew, is a thrust collar made of hardened steel. With the exception of the impeller, the shaft, the oil rings, the steel washers, and the thrust collar, the parts may be of cast iron.

*Manual Arts High School, Los Angeles, Calif.

Cold Iron as a Substitute for Wood

*William L. Hunter**

THE cost of wood as a raw material has been increasing rapidly during the past few decades. Metals, on the other hand, are being produced cheaper than at any time previously. This means that manufacturers everywhere are attempting to substitute metal for wood as a medium of construction. Our natural forest areas are being depleted rapidly and there is every indication that many of the common articles

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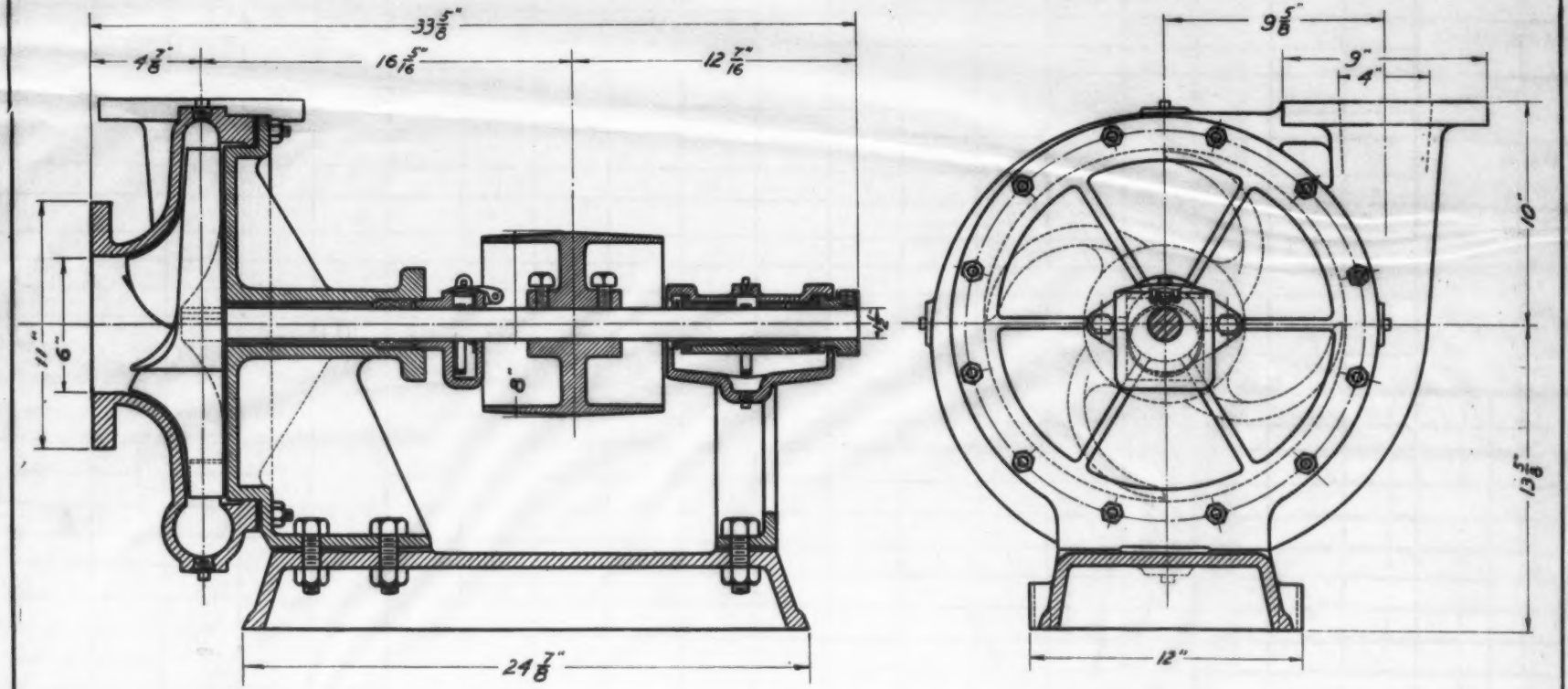
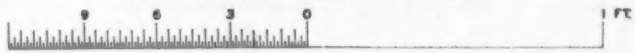


CENTRIFUGAL PUMP



A.F. '30.

Submitted by August Flam, Los Angeles, Calif.

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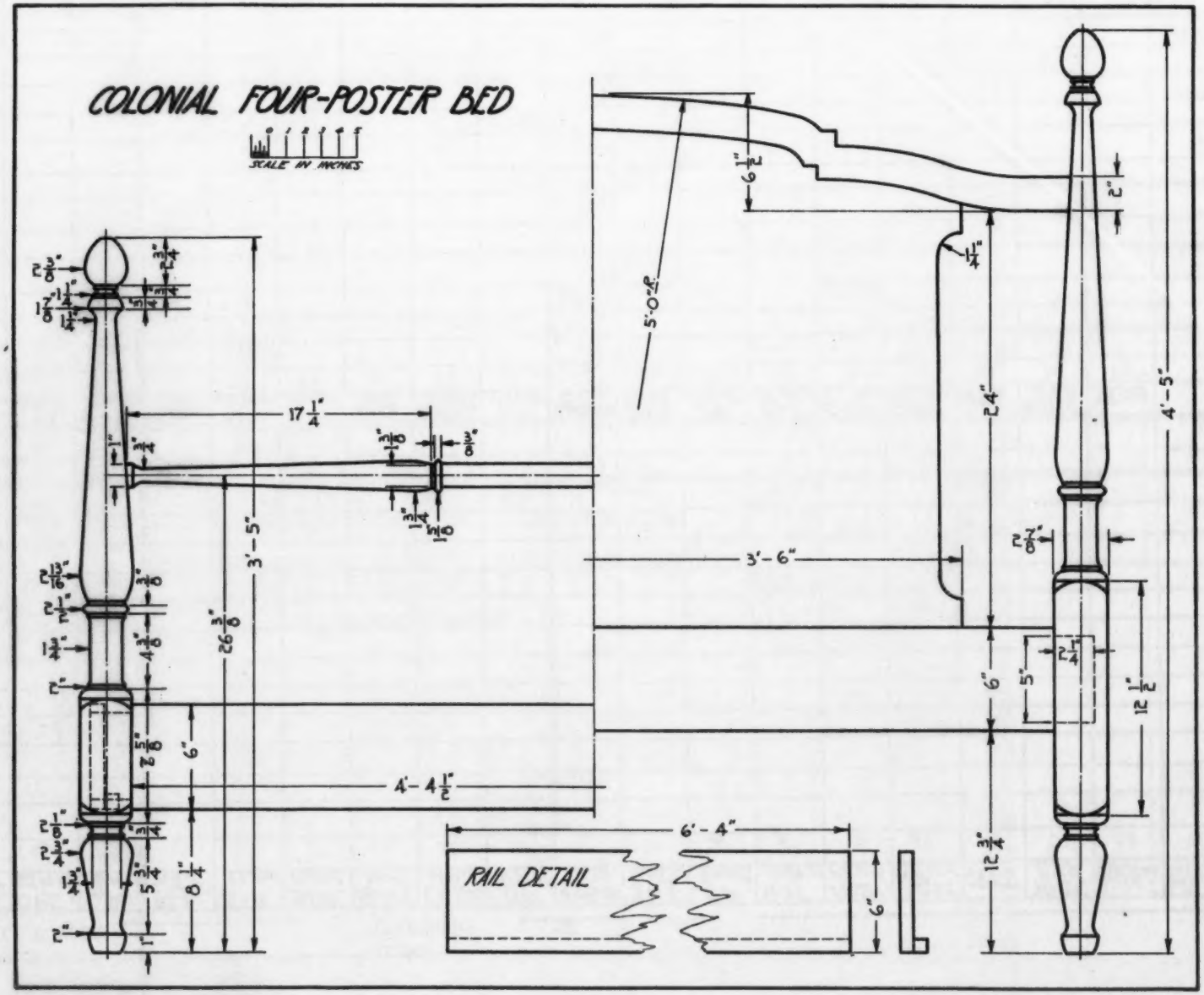
COLONIAL FOUR-POSTER BED



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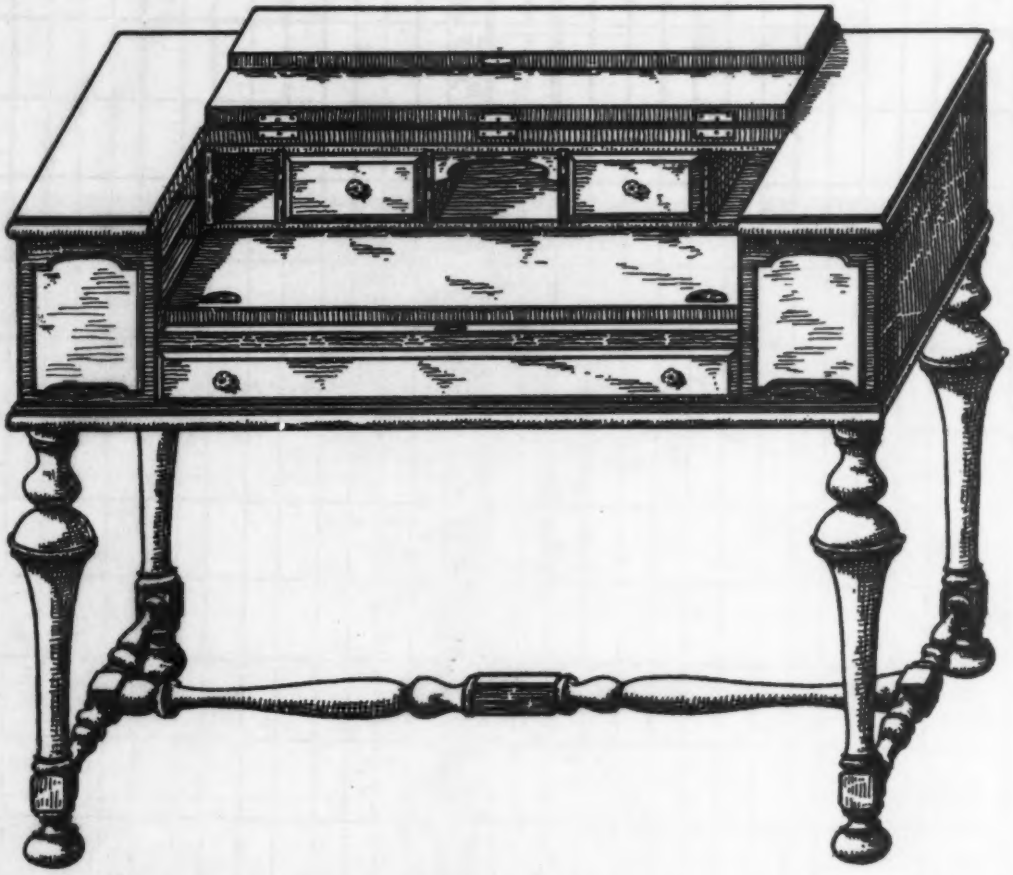
SPINET DESK

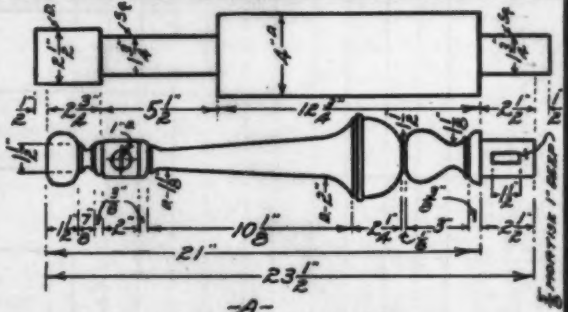
Advanced Woodwork

PROJECT SHEET A-311



Scale 1" = 1'.

LIFE DEMANDS THAT YOU NOT ONLY LEARN BUT DO.



-A-

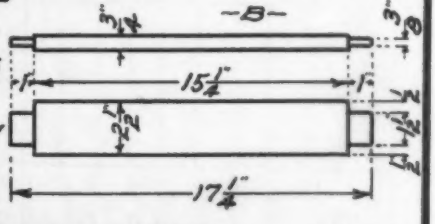
LEGS— WORK THE FOUR LEGS TOGETHER. JOINT UP FOUR PIECES OF 1⅜" SQUARE STOCK 24½" LONG. FINISH EACH SURFACE WITH A HAND PLANE TO REMOVE MILL MARKS. THEY ARE THERE WHETHER YOU CAN SEE THEM OR NOT. AT THE EXTREME END FOR 3¼" GLUE ON PIECES TO MAKE PART 2½" SQUARE. CUT PIECES 12¾" LONG, GLUING 5½" FARTHER ALONG TO MAKE 4½" SQUARE. SEE -A-

CENTER STOCK VERY ACCURATELY. TURN TO THE 2½" AND 4" DIAMETERS. WORK TO THE DETAILS SHOWN AT -A-

CHECK EACH LEG FOR LENGTH 23½" AND ESPECIALLY THE 21" TO THE SHOULDER. NOW DRAW THE TWO CENTER LINES FOR THE 1" HOLE AND DRILL 1" DEEP. W-9.

LAYOUT AND FORM THE MORTISE.

RAILS— MAKE THE TWO TOP RAILS AS SHOWN AT -B- CUT BOTH PIECES TO THE EXACT LENGTH AND THEN CUT TENONS. W-120.



Designed by Clifford B. Smith, Buffalo, N. Y.

Designed by Lyle M. Garnett, Milwaukee, Wis.

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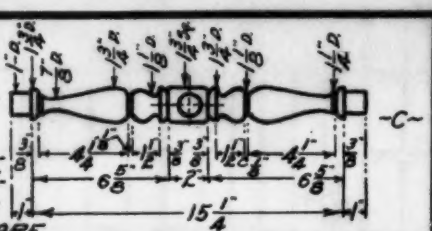
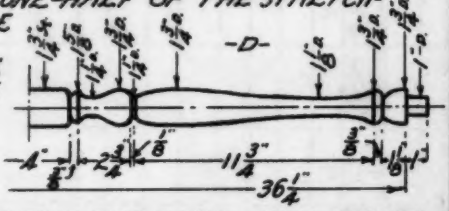
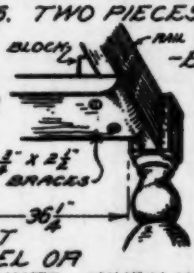
AT -C- IS ILLUSTRATED THE LOWER END RAILS. NOTE THE 1" HOLE 1" DEEP IN THE SQUARE CENTER PART. SAND ALL PIECES AND GLUE UP THE TWO ENDS. TEST FOR WIND AND SQUARENESS.

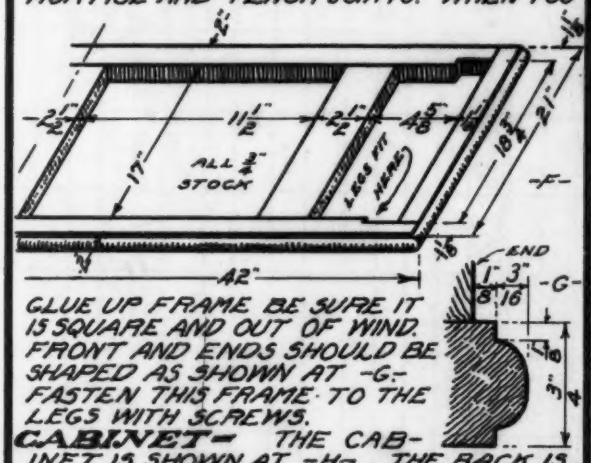


STRETCHER- THE SKETCH BELOW SHOWS ONE-HALF OF THE STRETCHER. NOTE THE SQUARE MIDDLE PART. AT -E- IS THE CONSTRUCTION AT THE TOP RAILS. TWO PIECES OF 3/4" X 2 1/2" STUFF KEEP CENTERLINE OF LEGS 38" APART. ASSEMBLE LEGS, STRETCHER AND BRACES. KEEP RAIL TOPS OUT OF WIND AND THE WHOLE BASE SQUARE & TRUE.





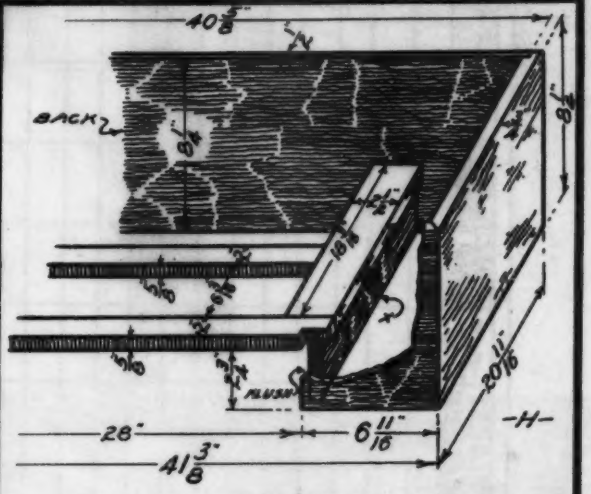
FRAME FOR TOP- MAKE UP THE FRAME AT -F- USING EITHER DOWEL OR MORTISE AND TENON JOINTS. WHEN YOU GLUE UP FRAME BE SURE IT IS SQUARE AND OUT OF WIND. FRONT AND ENDS SHOULD BE SHAPED AS SHOWN AT -G- FASTEN THIS FRAME TO THE LEGS WITH SCREWS.



CABINET- THE CABINET IS SHOWN AT -H-. THE BACK IS FLUSH WITH THE BACK EDGE OF THE FRAME WHILE THE ENDS AND FRONT ARE 3/8" FROM THE EDGE. IT IS SUGGESTED THAT THIS 3/8" LINE BE DRAWN IN ADVANCE. SQUARE UP THE TWO FRONT PIECES 3/4" X 8 1/2" X 6 11/16". CUT THE MITER AT ONE END AND APPLY DESIGN TAKING CARE TO HAVE A LEFT AND A RIGHT. SAND AND FASTEN TO THE FRAME WITH 1 1/2" SCREWS. TEST FOR SQUARENESS.

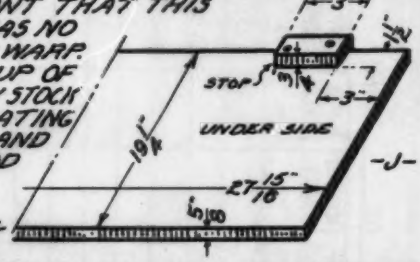
SQUARE UP THE TWO ENDS AND CUT A MITER AT ONE END AND A RABBET AT THE OTHER. SAND AND SIZE MITERS. LATER GLUE ENDS IN PLACE AND FASTEN ALSO WITH SCREWS TO FRAME. TEST FOR SQUARENESS.

PUT THE BACK IN PLACE.

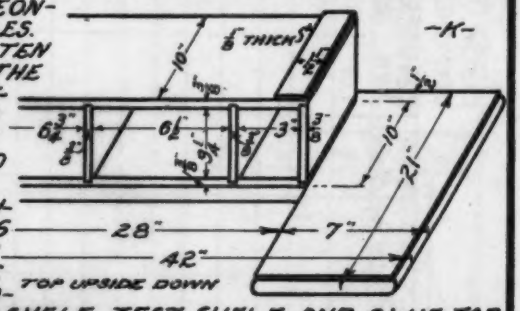


NOW CUT TWO PIECES (SHOWN AT X ABOVE), 3/4" X 2 1/2" AND LONG ENOUGH TO FIT IN PLACE. FASTEN TO FRAME. THE OTHER PIECES CAN NOW BE PLACED.

SLIDING SHELF- AT -J- WE HAVE ONE-HALF OF THIS SHELF. IT IS VERY IMPORTANT THAT THIS PIECE HAS NO WIND OR WARP. GLUE IT UP OF NARROW STOCK ALTERNATING HEART AND SAP WOOD SIDES. CARVE TWO HANDLES ON TOP SURFACE. FIT IN PLACE AND TACK TWO GUIDES ON EITHER SIDE, 3/4" X 3/4" X 19 1/4".

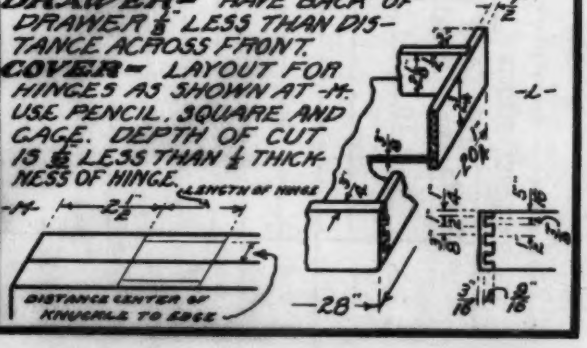


TOP- THE DRAWING AT -K- EXPLAINS THE CONSTRUCTION OF THE TOP AND THE PIGEON-HOLES. FASTEN TO THE LATTER THE TWO 1/2" RUNNERS FOR THE SLIDING SHELF. TEST SHELF AND GLUE TOP IN PLACE REINFORCED WITH BLOCKS.



DRAWER- HAVE BACK OF DRAWER 1/8" LESS THAN DISTANCE ACROSS FRONT.

COVER- LAYOUT FOR HINGES AS SHOWN AT -M-. USE PENCIL, SQUARE AND GAGE. DEPTH OF CUT IS 1/32" LESS THAN 1/2 THICKNESS OF HINGE.



which are now being made of wood will in a relatively short time be made entirely of metal.

If, then, metal is to be used more extensively in the very near future, a question immediately arises as to the value of training woodworkers as compared to training metal workers. Tradition is a tremendous force in education, and the tendency in most schools is to give an education which fits for citizenship twenty years ago rather than for citizenship twenty years hence. We must attempt to visualize our industrial life as it will be lived two decades from now, and then make a strenuous effort to revise our industrial-arts content in the light of these possible changes. There is no question but that fewer and fewer products of industry are being made of wood. We have metal window sashes, metal office furniture, metal hospital furniture, metal toys, metal lath, metal ships, metal railway coaches, metal airplanes, metal pencils, metal automobiles; wherever we turn we see something made of metal which was once made of wood. Changes in industry come overnight. There is reasonable possibility that fifty years hence wood will be almost as obsolete, as far as use is concerned, as is the Latin language now. Yet, as industrial-arts teachers, we sometimes are tempted to scoff at Latin as a school subject and at the same time we hang on tenaciously to wood as a medium for shop construction. Of course, many schools are not emphasizing wood as much as they did ten years ago, but there still is an unwarranted preponderance of woodwork instruction.

FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 6

FIG. 5

But adverse criticism is of little value unless some constructive suggestions are offered. The illustrations shown herewith will offer a few ideas which the woodworking teacher can use in his workshop without adding a great amount of equipment. These articles are all made of cold iron, either No. 20 gauge black sheet iron, or various sizes of band iron which may be obtained in any city at the various machinery supply houses. The cost of band iron or sheet iron as a raw material is extremely reasonable and ordinarily runs from a half to two thirds of the cost of the same article made of wood. Then, too, the iron is usable over

and over again, provided it is not bent. However, there is a minimum of spoiled work.

The footstool shown in Figure 1 is made of 3/16 by ¾-in. band iron and is unusually substantial and serviceable. There is more possibility for good design in cold iron than in wood. Note how the lines of the stool suggest grace and strength at the same time. Some instructors make the mistake of attempting to create a feeling of beauty by the excessive use of scrolls, twists, and bends. The most simple curves are often the most beautiful. The large-headed nails used on the top may be obtained from upholstery supply houses.

The book end shown in Figure 2 is made of No. 20 gauge black iron, the raw material costing about 3 cents for each book end. A ball-peen hammer may be used to secure the hammered effect. In addition to presenting a more attractive surface, the hammering tends to harden the metal and make it stiffer and more durable.

In Figure 3 are shown a flower-pot holder and bracket. The iron used is ⅛ by ½ in. The chain may be secured at a hardware store and the pots are obtainable from floral supply houses. The metal is best finished by filing or sanding after it has been hammered. Then it may be rubbed with machine oil. Some prefer to use lacquer thinned about one half. Too thick a coat of lacquer will give the work an undesirable yellow cast.

In Figure 4 are a lantern and bracket. The glass is an old quart peanut-candy jar from which the neck has been removed. A soft cotton string is soaked in kerosene. This is placed around the neck of the bottle and ignited. As soon as the flame dies away the jar is quickly immersed neck down in a pail of water. About one out of two jars break where you want them to but they cost nothing to begin with, so no damage is done.[1]

In Figure 5 is shown an electric wall sconce which is inexpensive and decorative. Black iron, No. 20 gauge, is used, except for the bracket which is ⅛ by ¾-in. band iron.

Figure 6 shows a small table which is graceful and serviceable. The legs may be made of 3/16 by ¾-in. band iron, but if an unusually substantial table is desired, the material should be ¼ by ¾ in. The top may be made of wood and covered with leather.

There is practically no end to the items of household furniture which may be made of cold iron. As industrial-arts teachers, we have had a tendency to become "wooden-headed." Let us in the future search diligently for those items of industrial experience which will be most likely to actually function ten or twenty years from now in the life of the growing generation rather than being content to teach what is sponsored by tradition.

[1]Editor's Note: The following method has been successfully used for cutting bottles:

1. Pour machine oil or used lubricating oil into the bottle, filling it up to the point where it is to be cut.
2. Heat to a red or even white heat as large an iron rod as will freely go into the neck of the bottle. Insert the rod into the oil, but be careful not to touch any part of the bottle. The glass will crack off evenly along the line of the surface of the oil.

Current Comment No. 3

The Average Before the Individual

Homer J. Smith*

AMERICAN education has always rightly sought to be popular and personal. In modern times one of its marked characteristics is an inordinate devotion to the single student in any group or school. If a teacher or administrator be unable or unwilling to forsake *class* consciousness and to exalt *personal* progress he is deemed reactionary or unprepared.

In industrial education, the field of our special interest, we have gone furthest in this "worship" of the individual. We organize schools and departments, inaugurate schemes of management, and prepare instruction materials seemingly with complete certainty that our service is to one. We tend toward tutoring as contrasted with teaching.

This article is not an appeal for the return of "lock-step" procedures nor a disparagement of the matching of individual differences. It does not seek to encourage standard educations or preparations. It urges merely a changed emphasis in favor of the *average* student of a class as the basis for professional attempts. There is question whether individuals really make a school and whether assisting one student after another really guarantees a course of study. It is suspected that some institutions that have discontinued "graduation" are pitifully consistent.

The widespread and increasing attention, in elementary, secondary, and special schools, as well as in the colleges, to differences among those enrolled is a development and a condition deserving of praise and pride. Grade skipping, subject promotion, ability grouping, differentiated curricula, and similar devices are of proved value. Such special programs as that at Winnetka are worthy of extension and continued experimental trial. Children do differ mentally, physically, in aptitudes for fields, and in emotional patterns. Homes and families do condition interests, attitudes, urges, and other traits. The psychologist, the psychia-

*Professor of Industrial Education, University of Minnesota, Minneapolis.

trist, the counselor, the nurse, and the home visitor are truly educational officers. The exploratory viewpoint, the methods of self-rating, and the improved records are commendable. In short, progress toward more and better education has been made through these means, all linked with the study of persons.

But whole-hearted acceptance of this ideal and of these aids does not force a classroom teacher to a method or a plan wholly or strongly individual. Indeed, detailed study of students and groups calls for the greatest possible variety in method, lest the learning ways of some be left unmatched in the process of teaching. The belief that students differ is not logically followed by the decision to instruct them all through a given method, even though individual in kind.

Excellent teaching presupposes that the instructor knows his subject and that he is able to view it in whole as well as in detail. It assumes, likewise, that he is able to select for the groups assigned him those parts of the whole which are most compatible with abilities, aims, and total time. This selection of units and their appropriate arrangement must have some base or foundational form to serve as a check upon the kind and amount of content. It is not an individual nor a number of individuals who constitute this guide. It is rather the class or group, viewed in the light of their average possibilities of attainment. To select and to arrange teaching units in keeping with an assumed group average is to construct a course of study. To attempt these without such a guiding or limiting factor is something else, not yet named in educational parlance. Let us plan our courses for the average.

Excellent teaching further requires that frequent decisions be made as to method, and the teacher who is most versatile in presentation has the greatest advantage for the attainment of results. For a teacher to know and to employ one method alone means that some students must fail by reason of his gross incompetence. It means, similarly, that some units of instruction must remain poorly or wastefully taught for the want of a method to match them. Pupils and course parts vary so greatly that to begin a term in possession of one sole means of approach is to invite failure — a failure rarely recognized by teachers of meager preparedness. The best and happiest teachers are those to whom method has become a study and a charm. These men can lecture, demonstrate, conduct drill, hold recitations, preside at round-tables, assign readings, guide written work, and control student-planning, and they can employ these means according to the day's demands. In addition they can do as well as others in meeting the problems of personal direction.

Little is known about individual method; certainly, not enough to enlist one's enthusiasm or to command his great respect. As to group procedures, we are rather well informed and experienced. It would seem to be wisdom for us to lean strongly upon the group presentations and to experiment with individual method in those fewer instances calling for extra and personal assistance. Considering the extreme difficulty of these special cases it may seem best, even with them, to use the individual approach with a good group plan. In opening a term or course the questions in importance must always be: By what means may each unit be presented to this group so that the greatest number will profit and the least time and energy be expended? By what method can the necessity for individual help be most reduced or nearest eliminated? Thus, again, we are brought to consideration of the group average. In methods choice, as in course planning, we place the individual secondary to the class.

Under the best possible grouping, the teacher must decide what work can be done by the average in the time allotted and he must anticipate the need of attention by the two extremes of this class. Manual-arts teachers are skilled in this process and it is urged that they hold fast to the plan of group consideration. Trade teachers are less likely to consider the group. They tend to think of their lists of teaching units, upon which they start all to work at varying speeds of attainment. To many, the helping of each pupil on his peculiar difficulties seems to be *teaching* while it is merely *a type of aid* needed by the few under a better system. There will always be the necessity for individual instruction, but the method need not be primary. Its effectiveness and its cost have yet to be shown in its favor.

Some students will be dull and slow for reasons such as low mentality, lack of background, feeling of inferiority, meager aptitude, poor health, fear, lack of interest, and the like. Others will be keen and rapid from causes directly opposite. Regardless of size of class, time of meeting, aim of course, or nature of content the two end groups will be recognizable. They are always present and if, by administrative act, they could be transferred to other sections, two similar groups would at once be noted through pure comparative rating. But, there is always the middle and average group who are our real concern. For these we select informational and manipulative content. For these we choose methods and texts and assignments. Other students will do more or less in accordance with their personalities. They will know and do from the start in a highly acceptable fashion or they will require much repetition and patient, frequent helping. They are the justification for individual instruction. They are the interesting centers of diversion and the agents permitting development of rare teaching skill and professional pride.

One wonders, as he visits a shop where individual work is the rule, how teachers can work contentedly with so little to develop inventiveness. The oversight of the separate efforts of a roomful of individuals seems a deadening employment when compared with the handling of a class with its constant call for resourcefulness and its irregular offering of thrills and chills.

It is urged that manual-arts teachers continue to plan definite courses of study for their several grades

or terms and that they continue to hope that all students can be brought to mastery of these allotted portions of work. It is urged that those in charge of trade-preparatory classes seek more and more to establish common requirements of skill and knowledge and that they seek to attain their goals through a variety of methods chiefly of whole-class or small-group type, reserving the means of individual instruction for the necessary after-help. Even in the evening adult and part-time classes of upgrading intention, there would seem to be a training gain and a financial saving in greater use of group teaching and control.

The individual ideal, carried to extremes in practice, means the denial of standards that may be understood and attainments that may be generally and definitely appraised. To carry each student from where he is to where he can get in the time he attends give somewhat of help but little in body that may be said to have current and recognizable value. A pupil and those who are to meet him later, as a student in advanced classes or as a workman in gainful employment, has a right to the feeling and the evidence that he has completed a named amount of specific instruction. Certain unit-course institutions have been careful in attempting to provide these certifications of accomplishment, but there are still hosts of teachers who cannot attest, except with defeating inconvenience, that their students are in any measure standard in what they have experienced.

Recourse to content and methods based upon average expectancy will heighten respect for training. It will likewise serve to protect institutions from the poor subsequent records of many with whom they have done their best but brought too little advancement. Definite courses mean failures, for some students simply cannot complete them. Schools and classes with no failures are unreal. They build false hopes. They prepare for shocks that are unwarranted and often irreparable. They lower public confidence.

Let us, for every subject and group, set up courses prepared for the average. Let us present each instructional unit by a method most appropriate for this middle group. Let us give reasonable time and effort to bring the slow to this standard, dismissing some for whom the expense cannot be justified. Let us hold advanced students, who cannot be removed, to a splendid degree of skill and understanding within the range of the course as first outlined. Such a plan will raise the general average, which is what the public expects. It will insure better studentship and better teaching. It will bring us standards in knowledge and performance. It will keep us from an overload of attention to those not typical. It will make us love our work because of frequent beginnings and endings and more definite appreciation of results. The individual student is worth worrying about but only after the aims of all have been served through a plan conceived for average progress.

GILT-LACQUERED TABLE, ENGLISH, 1709-1714
Photograph by The Metropolitan Museum of Art, New York City.

A Severe Bump

The boy in the above picture forgot that the top of the box was not fastened.

Never put a box away with the top lying loosely over it.

Loose table tops present the same danger when the unfinished projects are stored on top of cabinets or racks.

© Industrial Arts and Vocational Education

Submitted by Jos. J. Lukowitz, Milwaukee, Wisconsin

Danger, Look Out!

Never reach for sharp tools over the arms, heads, or shoulders of others.

The above picture shows that it is quite likely that some of the boys will receive painful cuts before all of the students have their chisels.

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Submitted by Jos. J. Lukowitz, Milwaukee, Wisconsin

PROBLEMS AND PROJECTS

FOUR-POSTER BED

Lyle M. Garnett, Milwaukee Vocational School, Milwaukee, Wisconsin

(See Supplement No. 225)

The bedroom set of which this four-poster bed is the first part to be published was built of mahogany, although walnut, birch, or well-selected gum will be quite satisfactory.

The posts and turned rail across the foot of the bed were turned in one length but they may be joined with a round tenon if one does not have a lathe long enough to accommodate the entire length. When making this joint, be sure to have it come underneath a bead so that the joint does not show. A tenon of at least 1 in. in diameter and 1¼ in. long should be used in case it is necessary to joint the post. The tenons for the stretcher should be proportionately smaller.

The bottom crossrails are mortised to the posts, while the top rail of the headboard is doweled into the post. When cutting the joint for the top rail of the headboard, cut the rail several inches longer than needed. Mortise and tenon the bottom rail into place. Temporarily assemble the lower rail and the two posts. Locate on the post the point where the top and bottom edges of this top rail are to come. Measure the distance between the top edge points. This distance will be the greatest length on this top rail. Caliper the post at these points. Add one half of this caliperation to the length of the rail at each end. This now gives you the center line of the posts. Square this center line on both the upper and lower edges of the rail so as to have the center lines of the posts properly projected on the top rail.

From the upper center line project an arc across the upper edge whose radius is equal to the radius of the post at the point where the rail and post meet. On the lower edge of the rail project an arc in the same manner, except that the radius must be equal to the radius of the post at the bottom point. One now has the joint of the proper shape to fit against the tapered curved contour of the post.

The joint may be cut entirely with a coping saw or it may be gouged out with a gouge of the proper sweep.

The headboard was made of ⅜-in. 5-ply veneer. One can also use ⅝-in. or ¾-in. veneer if it is available. In that case eliminate the use of the top rail.

The side rails have a strip of birch nailed and glued along the lower inside edge. This strip is to hold the slats that will, in turn, hold the spring. The side rails are fastened to the headboard and footboard by means of metal bed fasteners. There are two types on the market, one is of cast iron and the other is of wrought steel. The cast-iron fastener comes in two parts, one is fastened to the inside of the bed rail and the other is mortised into the post. When placing the mortised piece into the post, care must be taken so as not to get this piece either upside down or inside out, both conditions being possible.

The wrought-steel fastener is fastened to the rail by making a circular saw cut on the end of the rail just large enough to receive the fastener. Several holes are then bored into the rail and the metal pins sent with the fastener are inserted holding the fastener into place. The post is slotted in the proper place and the pins inserted from the inside of the post; be sure that the longer pins are reserved to be used in the post and not in the rail.

If the bedroom set is made of walnut, finish it natural. If it is made of mahogany it may be finished in either red mahogany or brown mahogany. The substitute woods such as birch or gum, may also be finished off in either of these two finishes. Several good coats of varnish rubbed to a perfectly smooth finish will complete the job. Mahogany and walnut will require a filler but birch or gum will not need to be filled.

With a reasonable amount of patience on the part of the student, he will be able to do a creditable job of this four-poster bed.

A SINK STRAINER

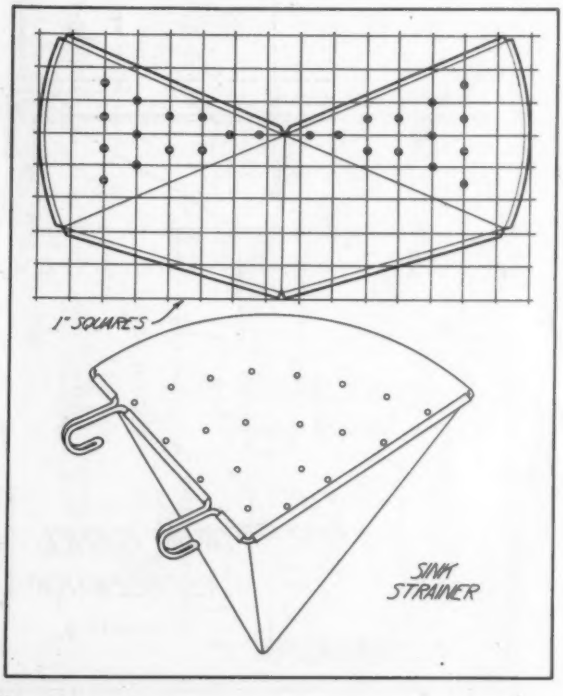
David S. Taff, Jason Lee Intermediate School, Tacoma, Washington

A sink strainer made of No. 24 zinc makes a simple and useful project well within the ability of a junior-high-school boy in advanced metal work, or a careful beginner in a senior-high-school metal shop.

As a project, its chief educative value is in giving the pupil an introductory experience in the working of zinc, and an idea as to its usefulness in sheet-metal work.

All the difficulties in the soldering of zinc are carefully avoided in the making of this sink strainer by the use of three bends, one lock seam, and a completely wired edge.

The squared drawing makes the laying out of the 8 by 15-in. sheet zinc easy, as each square represents one square



inch. All allowances for wiring are ¼ in. wide, while the lock seam edges are 3/16 in. Each hole in the sheet zinc is 3/16 in. in diameter and should be drilled and smoothed before any bending is done.

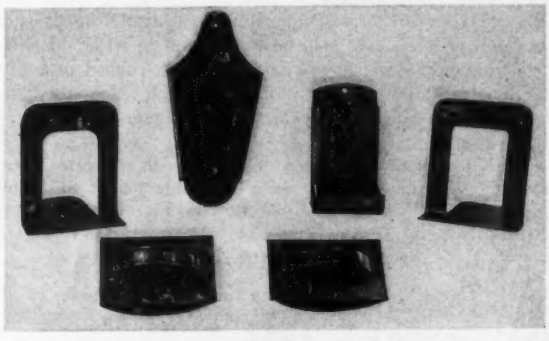
One piece of No. 12 coppered steel wire 38 in. long is used in wiring the edge and in the making of the two 3-in. side hooks.

As all sink edges are not alike, the boy should bend the wire hooks to fit his particular sink.

ATTRACTIVE METAL FINISHES

Sheldon Brooks, Tacoma, Washington

Many projects made in the junior-high-school metal shop may be made much more attractive by a simple use of



EXAMPLES OF ATTRACTIVE FINISHES APPLIED TO METAL PROJECTS

enamel and bronzing powder. This especially applies to objects such as book ends, match-box holders, calendar mounts, whisk-broom holders, dustpans, and numerous other projects, whose attractiveness can be enhanced by a touch of color or bronze powder, without detracting from the acquiring of desired working skills.

A finish very fitting for book ends, match-box holders, and other small projects consists of a coat of black enamel, supplemented, when dry, by immersion in water, on the surface of which are floated different-colored, quick-drying enamels, such as Flex or Waterspar. Black is suggested for the basic coat as it provides a background, against which other colors show off to advantage. Any two of the primary colors, red, blue and yellow, give pleasing combinations, although practically any mixtures of colors can be used. Place from two to five drops of each color on the surface of the water, and blow or stir with a wire until desired combination results on top of the water. Dip the article into the bath, using any twist or motion of the hand that will give a pleasing design. Withdraw the project at once and put it aside until the enamel dries.

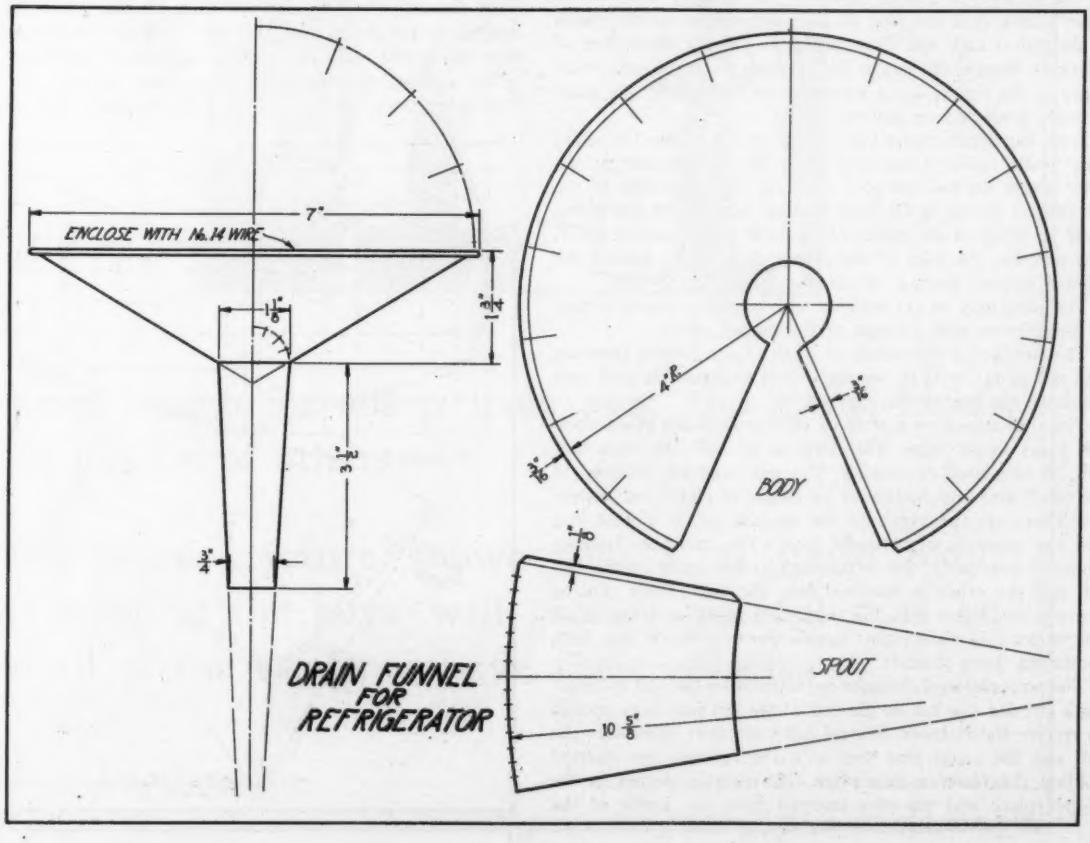
Another simple finish is obtained by blowing bronzing powder upon the surface freshly covered with quick-drying enamel, which also may be black in color. A bit of paper, 2 by 3 in., folded lengthwise, conveniently holds the bronze powder which is applied by short-breath puffs to various sections of the project. Of the 24 or more bronze powders, the shades to be most recommended are: aluminum (shade nearest approaching silver), light gold, deep gold, and deep copper. A final coat of clear shellac or varnish will prevent eventual tarnish of the bronze powder.

DRAIN FUNNEL FOR REFRIGERATOR

Alfred Grayshon, J. Cooke Junior High School, Philadelphia, Pennsylvania

The number of electric refrigerators is increasing but still we have hundreds of thousands of the ice-filled type.

The common method of catching the drip water is to put a pan under the drain. The daily duty of emptying the pan is sometimes forgotten with the result that it runs over.



If the refrigerator is on the first floor or other convenient place, a project can be made that eliminates the possibility of any pan running over.

This project is shown in the accompanying illustration. The drain funnel is preferably made of No. 26 gauge galvanized iron. The spout is placed in a hole in the floor. Use 1-in. pipe for continuance of the drain to discharge.

First, the body is developed with the extra allowance for solder seaming and wiring. Then cut out the blank and form to shape. Solder the lap seam thoroughly. Turn the outside edge to receive No. 14 wire. Cut enough wire for the circumference of this edge and shape it. Place the wire in the turned edge so that it overlaps the seam and close the edge over the wire.

Second, the spout is developed with solder lap allowance. Then it is cut out and formed. Now solder the seam. Locate it on the small end of the body and solder securely and water-tight.

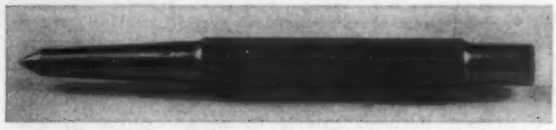
A good coat of asphaltum paint will prolong the life of this funnel.

MACHINIST'S PUNCH

Joseph Yuhasz, Central Junior High School, South Bend, Indiana

Finding simple and useful projects for junior-high-school machine-shop work seems to be a rather difficult proposition. Where the time is limited and only eighth-grade boys are handled in a general-shop class, the project should be as interesting as possible, and at the same time educational.

After the student has completed six weeks of bench metal work in the junior high schools of South Bend, Ind., the machinist's punch has been chosen as the first required lathe project. The job is written up in a very thorough manner so that the student can easily follow the instructions. This project teaches the boy the first fundamentals in lathe work,



which include centering, facing, straight turning, knurling, cutting off, taper turning with tailstock set over, and filing and polishing in a universal chuck.

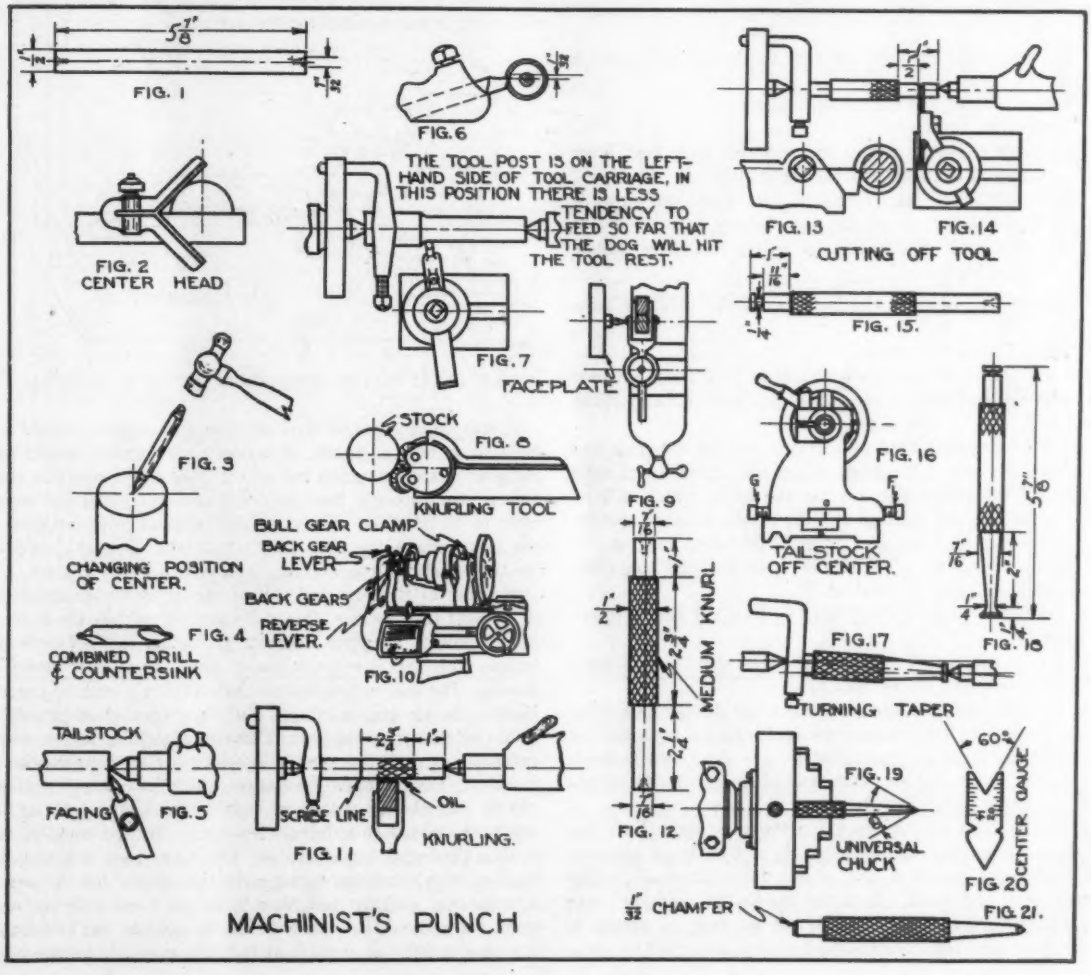
In addition to using the job sheet as a guide, the student is required to do a certain amount of reference reading. Such notes as "Ref. No. 1" refer to certain pages found in various books kept on the reference table. Fundamentals that are duplicated in job sheets are not described more than once, but reference is made to former instructions.

The average eighth-grade boy has been able to finish this tool in twelve to fifteen 50-minute periods.

Material: 1 pc. ⅝ by 6 in. tool steel.

Procedure:

1. Chalk each end of stock.
2. Using center head, scribe two crossing lines as shown in Figures 2 and 3.
3. Hold work in vise and center-punch both ends. (See Ref. No. 1.) Have instructor check.



4. Hold work exactly perpendicular in drill-press vise and drill center holes with combined drill and countersink (Fig. 4) to required diameter as shown in Figure 1. (See Ref. No. 2.)

CAUTION: Put a drop of oil on the work and feed the drill slowly.

5. Have instructor check.

6. Fasten the lathe dog on one end of the stock. Put red lead in dead center. (Ref. No. 4)

CAUTION: Be very careful to adjust centers so work turns very freely but not too loose so it will have end play.

7. With right-hand facing tool, face one end of the stock as shown in Figure 5. (Instructor will demonstrate.) Turn the stock end for end in the lathe and face the other end to the required length, as shown in Figure 1. (Ref. No. 29.)

8. Set up sharp, round-nosed turning-tool bit so that tip of bit is abut 1/64 in. to 1/32 in. above center line. (Ref. No. 3 and Fig. 6.)

9. Examine drawings for dimensions. (Fig. 1.)

10. Set outside caliper 1/64 in. larger than the desired diameter. (Ref. No. 6.)

11. Straight-turn as shown in Figure 7. Instructor will demonstrate. (See Ref. No. 5.)

12. Take several light cuts as far as possible toward the lathe dog. Check each cut at the beginning with the calipers. (Ref. No. 6.)

CAUTION: Use care not to get stock too small.

13. Set the calipers to exact required diameter and finish straight-turning.

14. Change work end for end, and in like manner turn other end of stock to the required diameter. Have instructor grade.

15. Knurling: Set up knurling tool as shown in Figures 8 and 9.

16. Mount stock between centers again.

17. Back gear the lathe.

a) With bull-gear clamp up, pull the back gear lever forward to lock the lathe. (Fig. 10.)

b) Loosen bull-gear clamp a half turn and drop it down to bottom of slot and tighten again.

c) Now pull on the belt to see if the lathe spindle turns freely.

CAUTION: Never move the back gear lever with the lathe running.

18. Have instructor check.

19. Start the medium rolls of knurling tool from end and feed them until the knurl reaches a depth of 1/64 in. (Fig. 11 and Ref. No. 7.) Use plenty of oil.

20. Set longitudinal feed of carriage and let knurling tool feed across the face of the work. When left end of knurl roller has reached the scribe line, reverse the lathe, which will reverse the feed of the carriage and the rotation of the spindle. Do not remove knurling tool from impression, but force it into the work another 1/64 in. Let it feed across the work. Repeat until knurling is finished.

21. Turn both ends of stock down to required size as shown in Figure 12.

22. Set up cutting-off tool and cut in on short end of stock as shown in Figures 13, 14, and 15.

23. Use this formula for computing the dead-center offset for taper turning: Total length of stock divided by length of taper multiplied by ½, multiplied by the difference between diameter at large end of taper and diameter at small end of taper, equals the tailstock set-over.

24. To set over the tailstock for taper turning (Ref. No. 12), loosen clamping nut of tailstock and back off setscrew G the distance required and screw in setscrew F a like distance until it is tight. Check the marks "O" and "O" with scale to measure the right amount of set-over, as shown in Figure 16. Then clamp the tailstock to the lathe bed.

25. Mount work between centers. Take cuts as in straight turning, cutting the taper as shown in Figures 17 and 18.

26. Remove work from lathe and lathe dog.

27. With a hack saw, cut off the ends of stock just beyond the center holes.

28. Remove faceplate from the lathe and attach universal chuck. (Fig. 19.) Wrap a piece of emery cloth or sheet brass around knurled end and chuck work in universal chuck.

29. Run lathe at highest speed and file the point to a 60-deg. angle, as shown in Figure 19. Test with center gauge shown in Figure 20.

30. Reverse work in chuck and chamfer opposite end 1/32 in., as shown in Figure 21.

31. Harden and temper about ¾ in. of the point to a dark-brown color. (Ref. No. 34.)

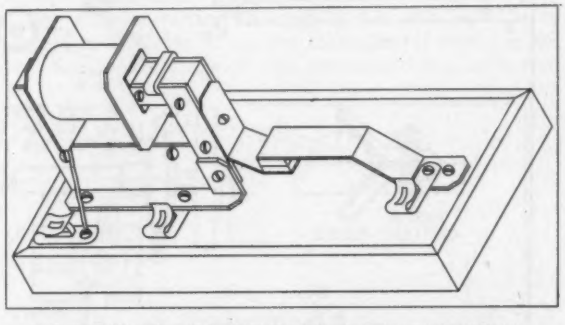
32. Place punch back in chuck. Run lathe at highest speed and polish with emery cloth and oil.

33. NOTE: If taper punch is desired, rather than a center punch, face end square instead of filing at angle.

THE RELAY AS A PROJECT

Wynne L. McDougal, Pullman Free School of Manual Training, Chicago, Illinois

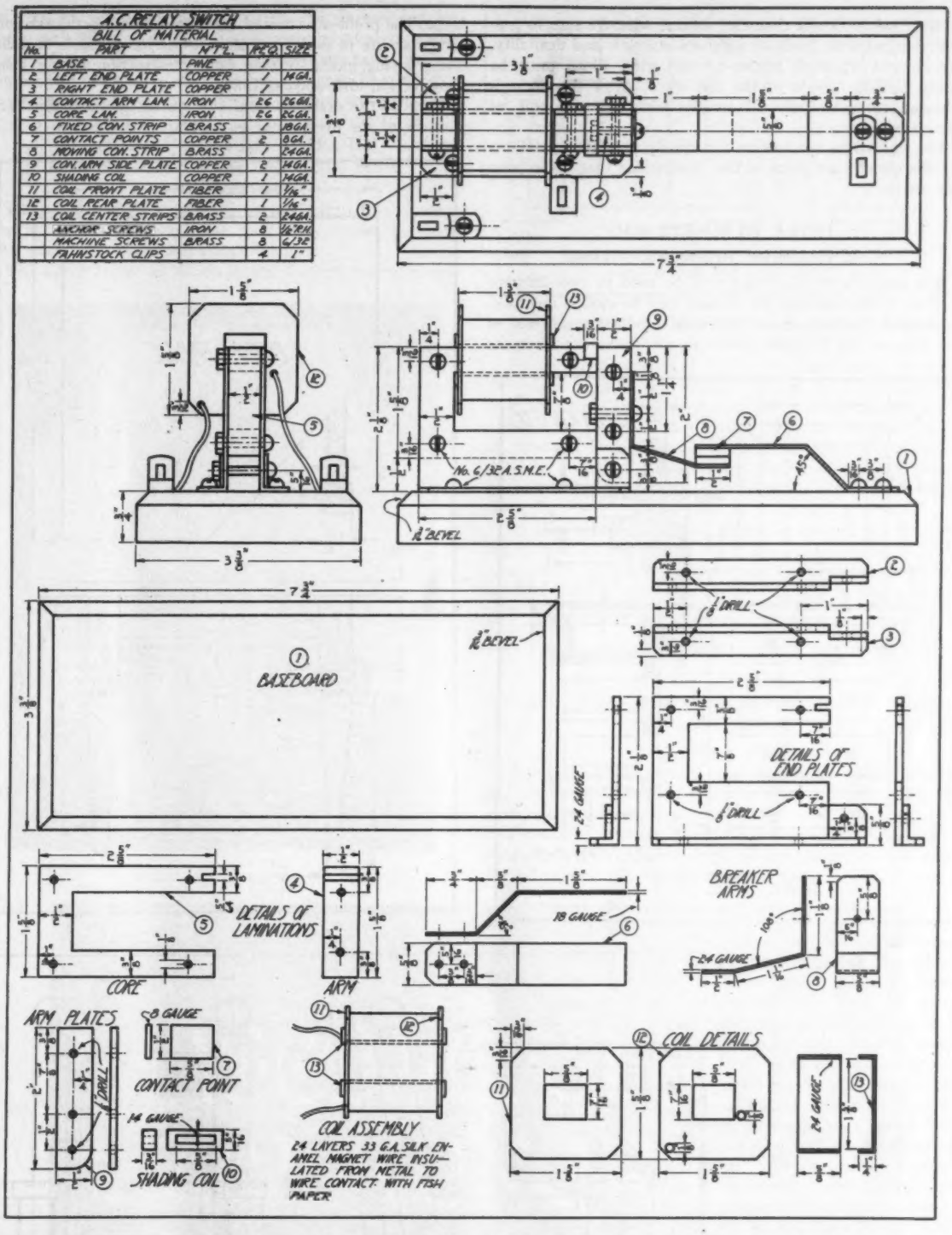
Projects involving electrical construction do not necessarily form a tremendously important factor in the presentation of vocational electricity. There are certain projects, however, which, because of their utility and the theory involved in their functioning, might well be used in the rounding out of any complete electrical course. The relay described herewith is such a project. When it was found necessary some years ago to have a remote control switch in the wiring course, a relay switch was devised for the purpose.



A.C. RELAY SWITCH DESIGNED BY WYNNE L. McDOUGAL

It was quite apparent that an open core magnet should not be used on an a.c. circuit, so a closed core with a hinged side member was constructed and a coil designed to suit this core. It was also apparent that even this piece of apparatus would have to be provided with a suitable shading coil, installed at the point where the core ends touch when brought together by the effects of the current, in order to avoid chatter.

A study of the core and coil of this relay may remind one of a small transformer. One side member of the core is movable, allowing a rather large air gap when the device is not in use. This gap is entirely closed when the magnet circuit is flowing. The coil is designed so that it takes a rush of current before the air gap is closed, and then very little circuit to hold the core ends together. There is a peculiar action which takes place in an a.c. circuit in which a closed air magnet is installed. The inductive reactance, which is a property of the circuit, has the advantage of causing the amperes to lag behind the voltage to a degree that some effect of wattless current is produced in the circuit. This then gives a device operating with minimum expense. It also allows for the use of a somewhat smaller coil than could be used with an open core. Care should be taken never to operate the coil unless the core is fully assembled, as it might probably burn out.


A.C. RELAY SWITCH
BILL OF MATERIAL
No. | PART | MAT'L. | REQ. | SIZE
1 | BASE | PINE | 1 |
2 | LEFT END PLATE | COPPER | 1 | 14GA.
3 | RIGHT END PLATE | COPPER | 1 |
4 | CONTACT ARM LAM. | IRON | 26 | 26GA.
5 | CORE LAM. | IRON | 26 | 26GA.
6 | FIXED CON. STRIP | BRASS | 1 | 18GA.
7 | CONTACT POINTS | COPPER | 2 | 8GA.
8 | MOVING CON. STRIP | BRASS | 1 | 24GA.
9 | CON. ARM SIDE PLATE | COPPER | 2 | 14GA.
10 | SHADING COIL | COPPER | 1 | 14GA.
11 | COIL FRONT PLATE | FIBER | 1 | 1/16"
12 | COIL REAR PLATE | FIBER | 1 | 1/16"
13 | COIL CENTER STRIPS | BRASS | 2 | 24GA.
ANCHOR SCREWS | IRON | 8 | 1/2" R.H.
MACHINE SCREWS | BRASS | 8 | 6/32
FAHNSTOCK CLIPS | | 4 | 1"
No. 6/32 A.S.M.E.
BASEBOARD
DETAILS OF END PLATES
DETAILS OF LAMINATIONS
CORE
ARM
BREAKER ARMS
ARM PLATES
CONTACT POINT
SHADING COIL
COIL ASSEMBLY
24 LAYERS 33 G.A. SILK ENAMEL MAGNET WIRE INSULATED FROM METAL TO WIRE CONTACT WITH FISH PAPER
COIL DETAILS

The laminated core serves to break up eddy currents. These currents produce heat, and if they are permitted to be set up in full strength in the core of a magnet, sufficient heat may be generated to seriously damage the windings of the coil.

The shading coil which is imbedded in the surface of one of the open ends of the cores should be constructed of material which possesses good conductivity, such as brass or copper, and it should be a complete ring encompassing from one half to two thirds of the exposed surface area of this core end. The ring is, in effect, a shorted secondary and as such comes into action only after a complete magnetic circuit is set up in the core. This delayed action provides for full magnetic strength for the heavier duty of contact making. With this strength materially decreased when the heavy secondary current is set up in the shading coil, it, in turn, sets up its lines of force to oppose the magnetic strength of the main magnetic circuit. In short, this arrangement allows for a strong pull for contact making and for a reduced pull for holding purposes. This is usually sufficient to silence the chatter to a satisfactory degree.

The relay shown in the accompanying illustration shows an actuating coil which is designed to be wound with 24 layers

of No. 33 A.W.G. silk enameled magnet wire. Be sure to provide the coil with leads of sufficient strength and flexibility, say No. 18 stranded, rubber-covered wire, which must be firmly fastened inside of the coil spool. After this item is attended to, practically all trouble with the coil will be eliminated.

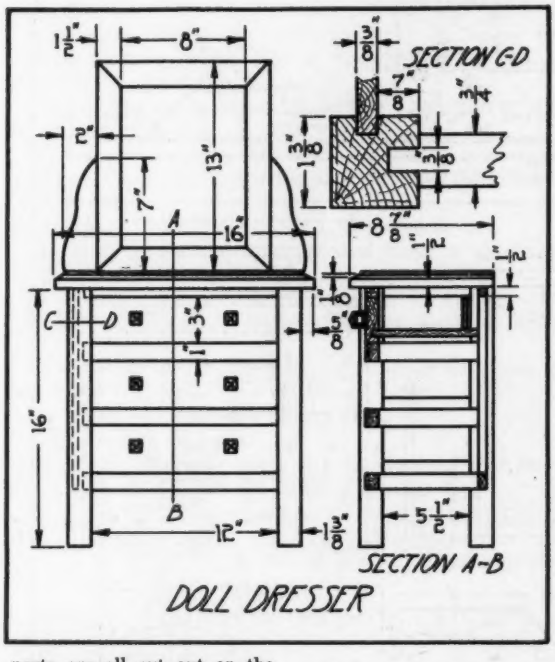
The rest of the mechanism can readily be made by following the dimensions given in the illustrations that accompany this article.

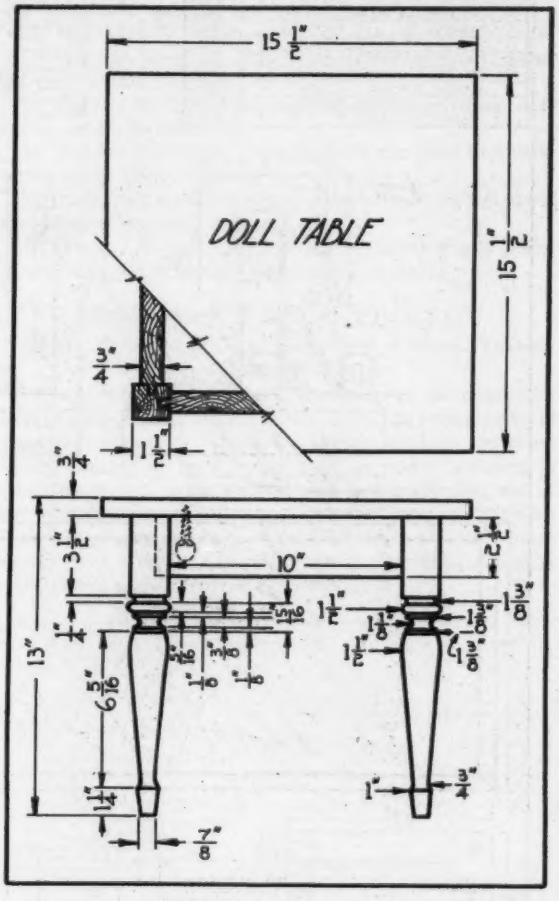
DOLL FURNITURE

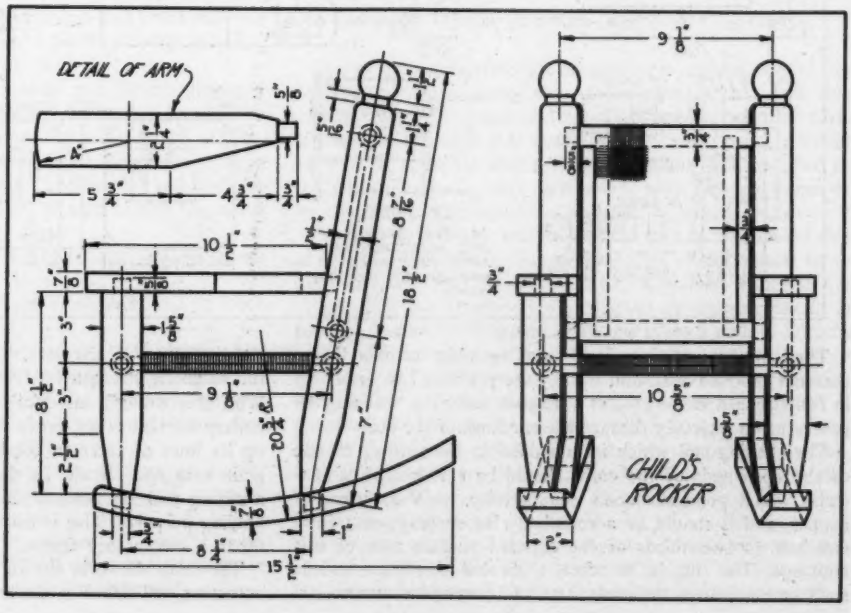
V. L. Huddleston, Arkadelphia, Arkansas

The projects in this group can be used in two different ways as to the teaching. All of them may be used as quantity-production projects or for individual production. Several of the dressers can be made almost as quickly as one when the parts are all cut out on the table saw. In the other two projects there is enough lathe work to give considerable practice. The chair should be made first because the turning is simple and easy. The legs of the table offer a little more difficult turning. The table also offers opportunity to teach different methods of table construction, such as mortise-and-tenon joints, dowel joints, use of corner braces, both wood and metal, and methods of fastening table tops. The caning of the chair offers possibilities of teaching different designs in caning. It also could be made a project in upholstering. The three pieces taken together cover quite a range of woodworking problems and it does not require a large amount of material to build them. The problems covered are mirror framing, drawer construction, use of table saw, mortise-and-tenon joints, dadoing and grooving, gluing, turning, table construction, caning, chair construction and wood finishing.

None of the drawings need any special interpretation. The drawers of the dresser are of standard construction. If it is







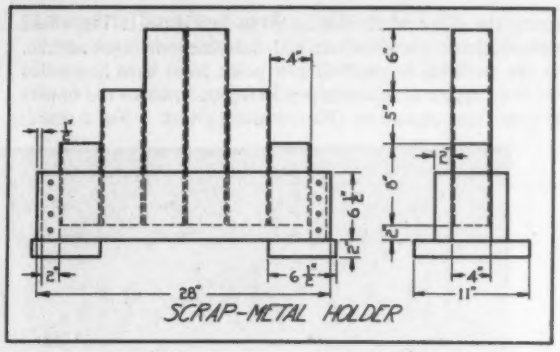
to have enamel finish the side panels can be made of any cheap wall board. The three pieces are very attractive when made of oak. The dresser and table should have furniture glides. The designs are all along rather sturdy lines which is necessary because of the usage the children will give them.

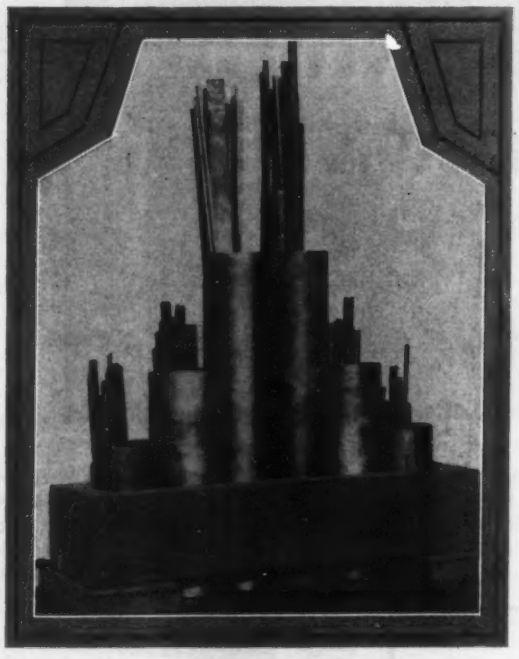
A SCRAP-METAL HOLDER

David S. Taff, Jason Lee Intermediate School, Tacoma, Washington

Many times short lengths of bar and strap iron accumulate in a metal shop because their sizes cannot be easily seen when they could and should be used.

The metal holder as shown in the drawing makes it easy to sort, keep neat, and see at all times the short lengths on hand.





SCRAP METAL HOLDER

As the holder consists of six No. 18 gauge black iron tubes of various lengths held tightly incased by a stout narrow box, little time and few materials are needed to make it.

Although the short tubes are 8 in. long, the medium 14 in., and the long tubes 20 in. in length, they are all rolled out 4 in. in diameter. These tubes should be made and placed in their proper position before the heavy box is built around them.

By placing the rectangular metal of random sizes according to their lengths in one of the sets of three tubes, and the round short metal the same way in the other set, little time need be taken to place the pieces in the tubes or to withdraw them when they are needed.

SIMPLIFIED SHOW-CARD PEN LETTERING

W. A. Thompson, Principal, Thompson School of Lettering, Pontiac, Michigan

Lesson II

The marking pen may be used to good advantage in making neat and attractive show cards at a very inexpensive outlay. It is a strong and positive device for producing rapid and clean-cut lettering which will enable one to acquire a substantial and easy method for making attractive show cards for all purposes. Note carefully the position of the pen in

FIG. 1. SHADED MARKING PEN ALPHABET

forming the different strokes as given in Figure 1. The small arrows indicate the direction and movement of each stroke. The one position or angle of pen point from base line holds good in all styles of marking-pen lettering. Practice the upper- and lower-case alphabets (Figs. 1 and 2) with a No. 1 marking pen, which will make a solid line or stroke, ⅛ in. wide, of the color used. In lettering, always use a downward stroke with pressure enough to make the ink flow, so that the outlines of the characters are smooth and sharp.

In shading letters of this style, always shade to the left as shown. Practice on one size until you have it thoroughly mastered, making the capital letters about ⅞ in. high, and the lower-case or small letters about ½ in. high. The tall lower-case letters h, l, k (Fig. 2) should be about the same height as the capital letters (Fig. 1). In making a lower-case b, first make the vertical stroke and then finish with the stroke producing the loop. Note exercises in the first two lines of Figure 2, showing the lower-case alphabet. For the letter s, begin with the stroke at the bottom, and then build up. Always work or form the letters from left to right.

To make well-balanced outlines of various kinds for show cards and price tickets, take a sheet of paper the same size as the card you wish to use. Fold this sheet twice, making it ¼ size, as indicated in lower left- and right-hand corners of Figure 3. Then cut the sheet with shears along the quarter portion of the design desired, which will produce a full-sized pattern when the paper is unfolded. Note the different designs — some are made by simply folding the paper once. An endless variety of neat and accurate patterns for show cards and border designs may easily be made by following this method. The designs made from paper folded in this way may be preserved for future use by cutting out the pattern in cardboard stock. Patterns, suitable for all sizes of cards and tickets, may thus be held in readiness for use at any moment. It was in this way that the card "Stop That Cough" (Fig. 3), was made.

FIG. 2. MARKING PEN ALPHABET, LOWER CASE

FIG. 3. PRICE TICKETS, SHOW CARDS, AND DESIGNS

White cards, lettered with black ink, shaded with light pea-green ink, and with ruled lines in red ink, present a very neat appearance. Lettering with a No. 1 marking pen should be shaded with a No. 0 marking pen. Larger size pens may be used in the same ratio.

Colored cards, such as blue, light green, red, etc., may be lettered in black and shaded with white ink.

Spacing should be determined by the form of the letters. There is no definite rule for it. Between full letters the space should be wider than between those that are open. For letters that are full at the bottom, let the spacing at the bottom govern.

Jobs to be Done in November

J. H. Dillon, Junior High School, Bloomington, Indiana

Editor's Note: **The jobs outlined here have been used by Mr. Dillon to make his school shopwork function in the home. He issues these bulletins (of which the one here shown is the third) in mimeographed form to his pupils. They act both as an incentive and as a reminder.**

Raking and Burning the Leaves

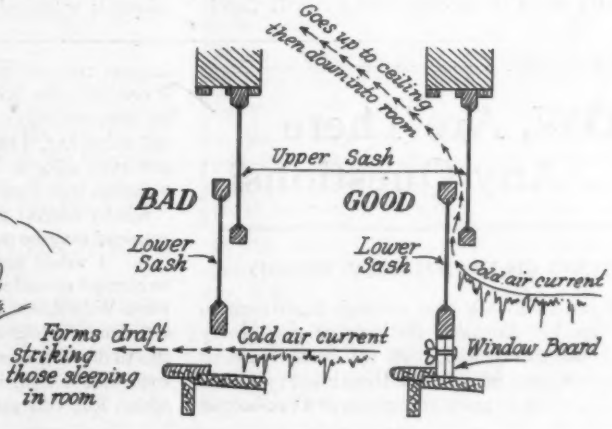
Raking and burning the leaves is a job like shoveling snow off the sidewalk, you may not have to do it in order to live, or get along, but no man ever made a success who did not do a little more than just what he had to do. Leaves left in the yard are unsightly. They also are unhealthy because they are covered with dirt. Furthermore, they are a fire hazard when dry, and they are likely to clog the sewers and drains. The leaves should be raked together and burned as often as possible. The city laws should be followed as to time of burning. Leaves may be used as a mulch but are not as good as some other available material.

Taking Down Awnings

Leaving up the awnings all winter is like leaving the garden hose out in the yard all winter. It not only shows carelessness and laziness, but is a very expensive practice. Awnings that remain up all winter will not last more than two or three years. If taken down when dry and stored away, they will last for many years.

Ventilation in Your Home

Don't let baby brother or sister sleep in a draft. Many thousands of people die each year from colds and many of these are caused from sleeping in a draft. There should be plenty of fresh air in your bedroom, but no drafts, because



it is bad for the health if cold, damp air is allowed to strike a sleeping person. The correct way to open the window is to raise the lower sash and place a board in the space below the sash. This method allows the air to come in between the upper and lower sash, and go to the ceiling of the room where it is warmed and then settles to the lower part of the room as warm, fresh air. These window boards, as they are called, may be made to fit any window.

Humidity

Have you been in houses where your lips seemed to dry up and you felt hot and dry? The cause of this especially in a hot-air or hot-water system is a lack of moisture in the air. In practically all hot-air furnaces there is a water pan that should be kept full of water. This water evaporates and moistens the air in the house. A pan of water placed on a hot-water radiator will help some.

Oil Door Hinges and Chairs

In the winter when the house is kept warm the hinges and chairs become dry and start to squeak. Door hinges also begin to rust if not kept well oiled. A can of Three-in-One Oil is a very useful piece of equipment in any boy's tool box. To oil the hinges on a door, lift the door up enough to loosen the hinges, then oil the pin.

Chairs should be turned upside down and a little oil placed where each round and leg is mortised into another piece. A squeaky board in the floor can sometimes be helped by placing a little oil in the joint.

Running Car in Closed Garage

Many people die each year from monoxide gas. This gas is thrown off by an automobile as exhaust. Monoxide gas is odorless and a person is too far gone to help himself before he notices anything wrong. When the weather is bad, people sometimes start their cars in a garage or basement and let their motor warm up, before driving out. If this is done *be very sure that the doors are open and that plenty of fresh air can get in.* The same is true when running the car into the garage or when working on it.

Containers for Flower Pots from Tin Cans

Flowers when kept in the house must be watered often. A muss is sometimes caused by pouring water into the flower pot and allowing it to run through the dirt and out the drain hole at the bottom. We know that it is better for a plant to draw the moisture from the bottom rather than have it

poured around the stalk which causes the surface of the soil to pack or cake. A very nice way for caring for both of these conditions is to make a small pan to set the flower pot in and in which the water can be kept.

Select a tin can that the bottom of the pot will fit into. Clean the can and cut off about 1½ in. from the bottom. Cut some trim or border around the edge and form the edge as shown in the sketch. Paint these containers and you will have an article that will not only be useful but will serve as an ornament to the flower pot. The number of different designs and patterns that may be used in making these containers is unlimited.

NOW, Are There Any Questions?

MATCHING OLD CHERRY WOOD

952. Q.: Will you kindly ask your research department to furnish us with specific directions for staining new cherry lumber to match old cherry wood that has been refinished natural, by giving two coats of very thin shellac and two coats of wax (Johnson's). We have made one section of a two-section banquet table of new lumber, to match the old section, that is possibly over 100 years old, and, of course, ordinary staining does not make a finish of a smooth aged texture that the old wood has. The pores become darkened and instead of a rich even color or shade it makes harsh, well-defined "grain" markings that show too obviously that it is new wood stained.

Kindly suggest possible places where the materials you recommend may be purchased. — *M. J. B.*

A.: I would suggest that a piece of the new cherry wood be cleaned up and sanded so as to be available for experimental work. With this at hand, try using a 2-oz. solution of potassium dichromate at the rate of 2 oz. per gallon of hot water. Allow this to dry about four hours to fully develop the color and then coat with a 2-lb. cut of shellac, using half orange and half white. Rub this with a split 6/0 paper and oil; or a felt pad

and pumice stone with oil. In this way you can best judge the color. If the match is not as close as desired then use another piece of the same cherry with a 3-oz. solution. By making these up on a pint basis, the test can be easily made without using much dichromate. Somewhere along the line you will find the combination that best suits your eye.

In case this does not satisfy, then it will be necessary to resurface the entire top and use a water stain to produce the desired results, although I feel that with a little patience a very satisfactory match can be had with the dichromate which may be bought at any drug store.

If you wish to purchase a pound of mixed dyestuff color at $2.25 postpaid, I will make up the match for you by return mail.—*Ralph G. Waring.*

Among the Industrial-Arts Teachers

MR. BAILEY ELECTED COMMISSIONER OF EDUCATION

Mr. Francis L. Bailey was elected as commissioner of education for the State of Vermont to succeed Clarence H. Dempsey. His duties began September 1.

MR. FRANCIS L. BAILEY
State Commissioner of Education,
Montpelier, Vermont

After being graduated from the Mount Pleasant, Michigan, State Normal School with a diploma and a life certificate, he attended the University of Michigan, where he received his A.B. degree in 1921, and his M.A. degree in 1924. After this he took further postgraduate work at the University of Chicago and at Teachers College, Columbia University, from which he is soon to receive his Ph.D. degree.

Mr. Bailey has had outstanding success in high-school work at Harbor Springs, Michigan, and Winnetka, Illinois. His natural gift of leadership is shown by the fact that he was president of the Men's Education Club at the University of Michigan and leader of the Ann Arbor Hi-Y Club, and is now president of the Graduate Club of Teachers College.

DR. NEWKIRK GOES TO CHICAGO NORMAL COLLEGE

Dr. Louis V. Newkirk who was formerly head of the industrial-arts department at the University of Iowa, will succeed Oscar L. McMurry at the Chicago Normal College where he will teach the courses in methods, organization, industrial arts, and general-shop work.

Dr. Newkirk received his professional training at Grinnell College, Stout Institute, and the University of Iowa, the latter university conferring upon him the Ph.D. degree in 1929. He was head of the industrial-arts department at the University of Iowa for six years and instructor at the summer sessions at this institution for four years.

DR. LOUIS V. NEWKIRK
Chicago Normal College,
Chicago, Illinois

He is a member of the Epsilon Pi Tau, national honorary fraternity in industrial arts and vocational education; Phi Delta Kappa, honorary fraternity in education; member American Vocational Association, National Education Association; member of A. V. A. Committee on Scientific Testing in Industrial Arts; and member of the Manual Arts Conference. He is the author of several professional books and a regular contributor to the periodic literature of his profession.

—⌖—

¶ Prof. Adolph Shane has retired as head of the industrial-arts department at the Iowa State College, Ames, Iowa. He went to Iowa State College in 1920 as head of the department of trades and industries to direct the work for world war veterans. Before going to Iowa State College, he was head of the engineering work at Des Moines University.

¶ Mr. J. A. Ratcliff, of Tyron, Okla., has been employed as instructor in vocational work at Friendsville Academy, Friendsville, Tenn.

¶ Mr. W. R. Busch, of Montgomery, Minn., has been employed as manual-training instructor at Pipestone.

¶ Mr. J. B. Perky has been appointed as state supervisor of vocational agriculture for Oklahoma.

¶ Mr. Henry Wollin has been elected as a member of the vocational-school board at Madison, Wis., to succeed F. H. McClain.

¶ Mr. Alfred Palm, Jr., has been appointed as employer-member of the board of vocational education at Shorewood, Milwaukee, Wis.

¶ Mr. L. W. Hess, of the Riley Junior High School, South Bend, Ind., has been given a year's leave of absence to take a graduate course at the University of Michigan. Mr. Hess acts as assistant in the school of education at the university.

¶ Mr. Melvin Reese has been appointed as guidance counselor and instructor in the vocational school at Green Bay, Wis.

¶ Mr. A. G. Cleaver, instructor in the vocational evening school of Fort Wayne, has been appointed instructor in mechanical and architectural drawing in the Y. M. C. A. technical school.

¶ Miss Edith R. Dopp has become a member of the faculty of the welfare department in the vocational school, Madison, Wis.

¶ Mr. E. R. Raney has been appointed district supervisor of vocational rehabilitation work in Texas. Mr Raney has his headquarters at Dallas.

¶ Mr. James C. Dodge, a graduate of Stout Institute, has been appointed as instructor in the vocational school, South Milwaukee, Wis.

¶ Mr. Arnold Dietrich, of Cedarburg, Wis., is an instructor in the vocational school at West Allis, Wis.

¶ Mr. Harrie Hoss, of Algoma, Wis., has been appointed as instructor in the vocational school at Wausau, Wis.

¶ Mr. E. E. Richards, of Prairie du Chien, Wis., has been elected to a position in the Milwaukee Vocational School.

¶ Mr. Rudolph Hanson has been reëlected as director of the vocational school at Superior, Wis. The appointment is for a three-year term.

¶ Mr. F. R. Stepp was elected as instructor in electricity in the vocational school at Oshkosh, Wis.

¶ Mr. N. M. Pittman, mechanical-drawing instructor in the San Antonio public schools, received a master of science degree from the Agricultural and Mechanical College of Texas.

Association and Convention News

THE A.V.A. CONVENTION

The American Vocational Association will hold its sixth annual meeting in New York City, December 9 to 12. The Hotel Pennsylvania will be the headquarters.

The first meeting will be a get-together party on Wednesday evening, December 9. There will be the general sessions with their special offerings as well as numerous sectional meetings. The general theme of the sectional meetings will be "Social and Economic Trends in America," and Dr. L. A. Wilson, assisted by the respective vice-presidents of the A. V. A. will arrange for both the topics and the speakers.

On Friday and Saturday forenoons there will be the section and subsection meetings in agriculture, trade and industry, industrial arts, home economics, commerce, civilian rehabilitation, vocational guidance, part-time education, etc. Each of the vice-presidents will be responsible for his programs in his respective sections on these occasions. The theme of these sectional meetings will be "What is Vocational Education Doing to Prepare Wage Earners to Adjust Themselves Effectively to the Social and Economic Trend in America as Portrayed by the Speaker at the General Sections." There will also be numerous round-table discussions. Besides these meetings, there will be many opportunities offered for trips to schools, museums, industrial establishments, commercial offices, etc.

The A. V. A. is offering much that is of interest to the industrial-arts teacher. Mention need but be made of the study carried on by the A. V. A. Committee on Standards. Both the vocational-education and industrial-arts men owe it to themselves to attend if possible this convention which will undoubtedly be the greatest of those held so far.

THE NEVADA VOCATIONAL CONFERENCE AT LAKE TAHOE

The eighth annual vocational conference was held August 17 to 26, inclusive, at Lake Tahoe, Nevada. In connection with the conference, a number of special group meetings in home economics, trade and industrial education, and agriculture, were held. Mr. H. H. Hulbert, of the Federal farm board, and Mr. W. T. Spanton, federal agent for agricultural education, acted as conference leaders in discussing problems connected with the work.

Among the topics taken up by the conference were cost accounting, project planning, teaching different types of farm jobs, farm mechanics, and new type tests in agriculture. Miss Jane Hinkley, federal agent in home economics, presented some new and interesting suggestions on the teaching of home economics by means of home projects. Miss Eloise Davison led the discussions on electricity and its use in the home.

The trade and industrial leaders were James R. Coxen, Washington, D. C.; D. W. Rockey, state supervisor of trade and industrial education; and O. D. Adams, state supervisor of trade and industrial education for Oregon. Mr. Coxen opened the conference with a talk on "Problems in General Industrial Education." Mr. Adams had charge of the discussion on "Related Courses in Connection with Trade Courses," taking up what should be taught by the related-subjects teacher. Mr. Rockey took charge of the group in courses of study. A number of separate groups worked out courses in mineralogy, surveying, sheet-metal work, and roof framing.

EL PASO TEACHERS' CLUB ELECTS OFFICERS

At a recent meeting of the El Paso Industrial Arts Teachers' Club, the following officers were elected for the coming year: President, T. Pettie; vice-president, Geo. Shalkhauser, and secretary-treasurer, F. Heidelburg. C. J. Smith, the retiring president, presided at the meeting.

INDUSTRIAL-ARTS ALUMNI ASSOCIATION BREAKFAST

The Industrial-Arts Alumni Association of Oshkosh State Teachers College, Oshkosh, Wis., will hold its annual club breakfast, business, and social meeting on Friday morning, November 6, at eight o'clock in the Dutch Room of the Boston Lunch Cafeteria, 607 W. Wisconsin Ave., Milwaukee, Wis. This meeting will be held in connection with the Wisconsin State Teachers Convention held at Milwaukee, November 4 to 7, 1931.

The officers of the Industrial-Arts Alumni Association of Oshkosh State Teachers College are: President, Earl W. Thrall, Senior High School, Beloit, Wis.; and secretary, Albert Johnson, Vocational School, Beloit, Wis.

New Publications

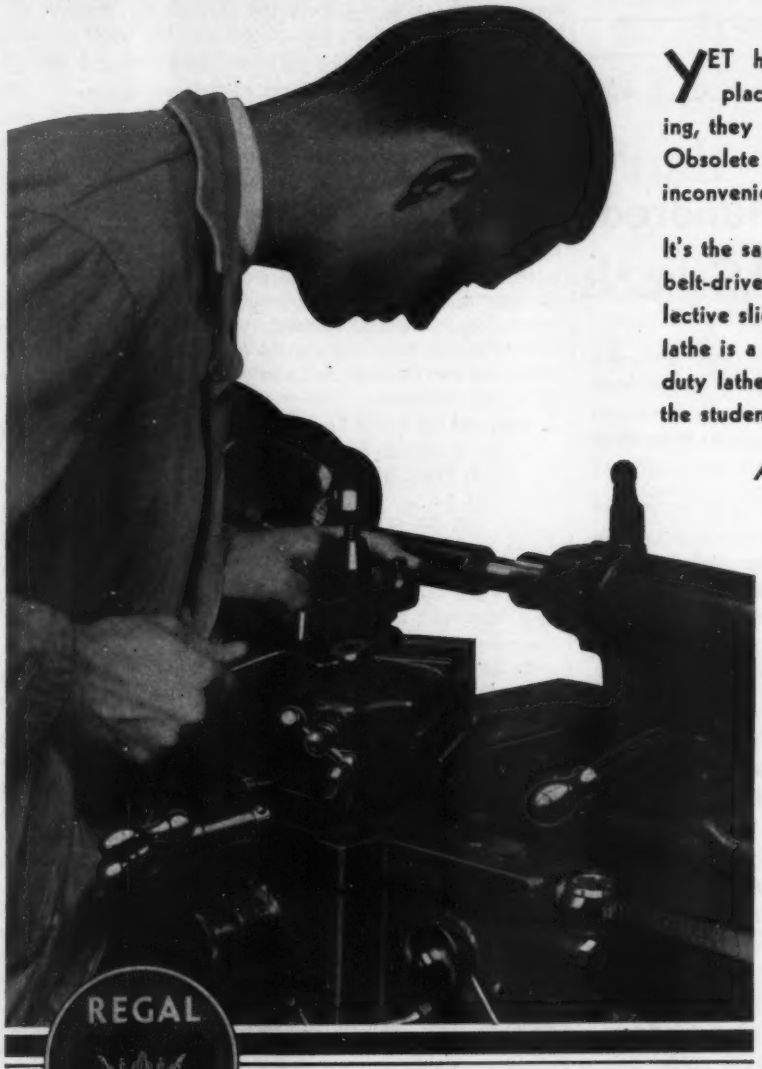
Mathematics for Electricians

By Martin H. Kuehn. Cloth, 220 pages, 5¾ by 8¼, illustrated. Price, $1.75. Published by McGraw-Hill Book Company, New York City.

This book is designed to present the trade mathematics which the electric worker requires. The material is so chosen that it represents actual electrical problems. There is sufficient algebra introduced to give the student a working knowledge of it and the same is done with trigonometry, so that the student acquires sufficient grasp of the mathematical principles involved in solving the problems of his trade.

(Continued on Page 16a)

YOU WOULDN'T TEACH YOUR BOY TO DRIVE A HORSE CAR . . .



YET horse cars are still used in remote places. But where folks are up and coming, they demand economical transportation. Obsolete methods of travel are costly and inconvenient.

It's the same way with lathes. Instead of being belt-driven, the Regal (shown here) has a selective sliding geared headstock. In fact this lathe is a counterpart of the LeBlond heavy duty lathes so well known in the shops where the students expect to work after graduation.

A request will bring detailed descriptive literature.

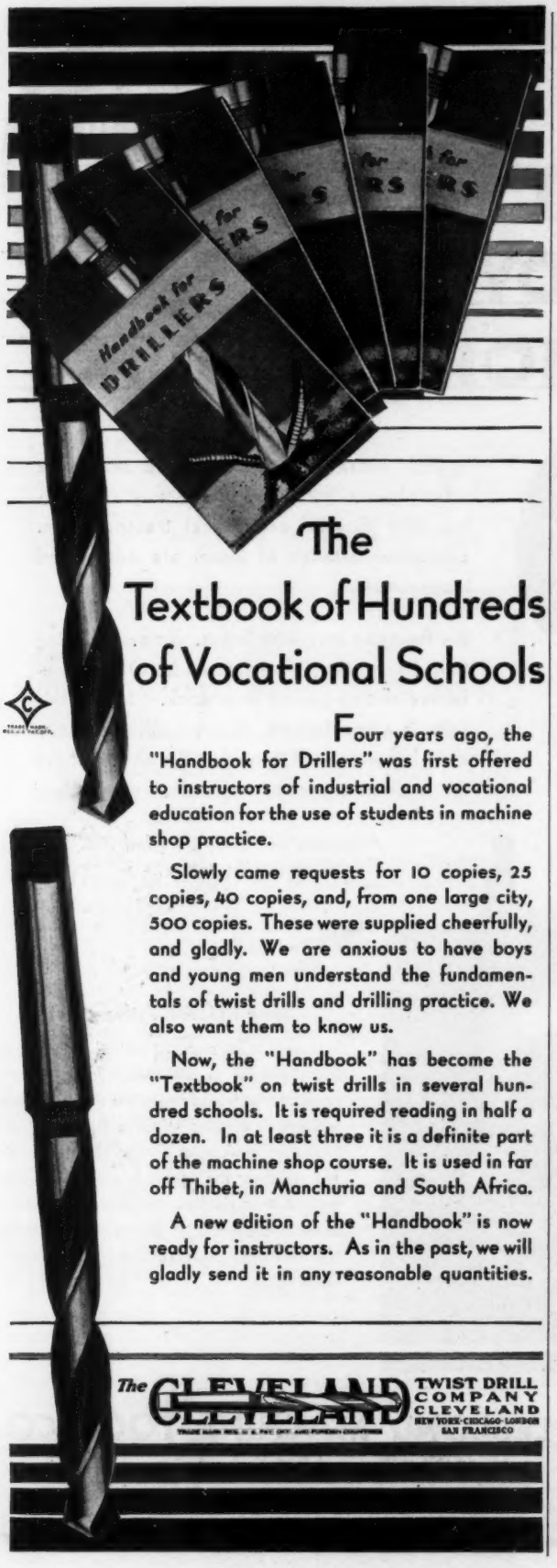
Some REGAL Advantages

It is made in five sizes, 10" to 18". Prices range from $275.00 to $947.00, F.O.B. factory. Equipped with feed rod to take the load off the leadscrew, 8-speed selective sliding geared headstock, with quick change speeds that do not endanger the operator; one-piece apron with all gears rigidly supported, positive clutch control, quick change geared feed, compact built-in motor. Lathe is delivered (with motor) ready to run.

REGAL BUILT BY LE BLOND

SEE OUR DATA IN BRUCE'S SCHOOL SHOP ANNUAL 1931 EDITION

THE R. K. LEBLOND MACHINE TOOL CO.
CINCINNATI, OHIO


Handbook for DRILLERS
The
Textbook of Hundreds
of Vocational Schools
Four years ago, the "Handbook for Drillers" was first offered to instructors of industrial and vocational education for the use of students in machine shop practice.
Slowly came requests for 10 copies, 25 copies, 40 copies, and, from one large city, 500 copies. These were supplied cheerfully, and gladly. We are anxious to have boys and young men understand the fundamentals of twist drills and drilling practice. We also want them to know us.
Now, the "Handbook" has become the "Textbook" on twist drills in several hundred schools. It is required reading in half a dozen. In at least three it is a definite part of the machine shop course. It is used in far off Thibet, in Manchuria and South Africa.
A new edition of the "Handbook" is now ready for instructors. As in the past, we will gladly send it in any reasonable quantities.
The CLEVELAND TWIST DRILL COMPANY CLEVELAND
NEW YORK-CHICAGO-LONDON
SAN FRANCISCO

(Continued from Page 422)

Detailing and Fabricating Structural Steel

By F. W. Dencer. Cloth, 441 pages, 6¼ by 9¼, illustrated. Price, $5. Published by McGraw-Hill Book Company, New York City.

This is the second edition of this very much worth-while book. It thoroughly covers the problems of design, methods of making drawings for the shop, routing the material through the shop, estimating and pricing jobs, etc. The appendix consists of a classification of structures which contains approximately 8,800 names. It also embraces a very comprehensive list of shop terms which will materially assist the student.

Coping Saw Work

By Ben W. Johnson. Paper cover, 28 pages, 6 by 9, illustrated. Price, 40 cents. Published by The Manual Arts Press, Peoria, Ill.

This little booklet is a revision of an earlier edition under the same name. It contains a large number of interesting examples of coping-saw work and through the revision has been brought up to date, with reference to the newer methods of prsenting work to the student and encourage the student in producing original designs.

Concrete Design and Construction

By Walter L. Webb and W. H. Gibson. Cloth, 388 pages, 5½ by 8½, illustrated. Price, $2.50. Published by the American Technical Society, Chicago, Ill.

This is a very complete book on the subject of concrete design and construction in all of its phases. Its contents may be briefly grouped under the following headings: Cementing materials, cement testing, concrete, waterproofing concrete, methods of mixing concrete, steel for reinforcing concrete, foundations, footings, retaining walls, walks, curbs, reinforced-concrete-beam design, flexure and direct stress, specifications for concrete and reinforced concrete, and design of factory buildings.

Printing and the Allied Trades

By R. Randolph Karch. Cloth, 226 pages, 5¾ by 8⅜, illustrated. Price, $1.50. Published by Isaac Pitman & Sons, New York City.

This text on printing contains all that the junior-high-school student really needs in the line of practical work as well as in the field of related-subjects matter. The book is much more complete than its size would lead one to think. It is interesting and quite complete.

Commercial Art and Design

By Ray J. Matasek. Cloth, 288 pages, 6¼ by 9, illustrated. Price, $3.50. Published by The Bruce Publishing Company, Milwaukee, Wis.

This book contains in a brief and comprehensive manner what the student of commercial art and design needs to prepare him for his future work. Each chapter may be looked upon as a unit which contains explanatory material, examples of work, and problems for the student. Besides these problems there are numerous hints which call the student's attention to practical applications which surround him on every side. A glance at the Table of Contents shows how well the author has covered the subject. The following are the titles of the chapters:

Materials; the use of drafting instruments; photo-engraving; pencil drawing in outline; black-and-white drawings; lettering; type; composition and layout; color; historical design; symbolical subjects; historical design applied to modern needs; modern design; the halftone cut; wash drawing; line color plates; show-card writing; cartooning; practical problems; posters; book covers; and book jackets.

Wood Floors

Paper, 32 pages. Published by the National Lumber Manufacturers' Association, Washington, D. C. A study of the possibilities of wood floors that will be both useful, economical, and artistic.

(Continued on Page 17a)

(Continued from Page 16a)

Effectiveness of Moisture-Excluding Coatings on Wood

By George M. Hunt. Paper, 28 pages. Circular No. 128 (October, 1930), U. S. Department of Agriculture, Washington, D. C.

The pamphlet reports the results of various experiments of the Forest Products Laboratory on the moisture proofing of wood by coatings and impregnation treatments. The objective of most of the treatments has been to reduce the changes in moisture content of wood resulting from exposure to water, to the weather, or to changes in atmospheric humidity. In a few instances, materials have been employed with the object of reducing the amount of shrinking and swelling with a given moisture change, rather than trying to prevent changes in moisture content. It was found that the most effective resisting coatings for wood are those containing aluminum leaf between coats of other materials, such as paint, varnish, or the like. For exterior exposure, linseed-oil paint is very effective for use with aluminum leaf, because it stands up well under weathering. For interior use with the leaf, either varnishes, enamels, or paints were found suitable. Varnishes made with artificial resins of the bakelite type appeared to be superior in moisture-excluding effectiveness to ordinary spar varnishes. It was noted that deep impregnation treatment is not so necessary as a continuous film over the surface. Coatings or treatments with linseed oil, floor wax, and the like, are low in effectiveness.

Graded Shop Problems in Five Units for Special-Class Children

Prepared by Miss Claire Foster. Paper, 109 pages. Price, 60 cents. Issued by the state board of education, Hartford, Conn. A course of study prepared for children below the average in mental ability. The work has been carefully graded, and the articles are accompanied by good working drawings and instructions for the teacher.

Machining Aluminum and Its Alloys

The Aluminum Company of America, Pittsburgh, Pa., has issued a small booklet on "Machining Aluminum and Its Alloys." The treatise discusses the machining characteristics of aluminum as compared with those of steel and free-cutting brass. The shapes of the tools for various machining operations are given, but tables for specific values for speeds and feeds are not included. It takes up cutting tools, lathe tools, planer and shaper tools, milling cutters, threading tools, twist drills, reamers, saws, files, grinding wheels, cutting speeds and lubricants, and finish. There is a list of helpful references and a table of weights and areas of aluminum.

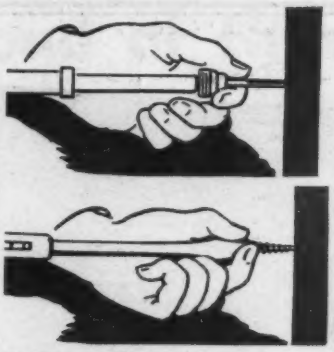
Welding of Aluminum

The Aluminum Company of America, Pittsburgh, Pa., has issued a booklet on *The Welding of Aluminum*, which is devoted to the needs of the practical welder. It discusses methods particularly adapted to the joining of aluminum and alloys and describes the welding of aluminum. Special attention is given to fusion welding, torch welding, welding pure aluminum, welding castings, and spot welding. The booklet contains a number of photographs and some suggestive tables for use in the work.

A World Calendar

The World Calendar Association, Inc., 485 Madison Ave., New York, N. Y., has announced a new world calendar, which consists of twelve months revised to meet modern requirements. It considers the year as the principal unit, with divisions and subdivisions into halves and quarters.

The calendar conforms to the four cardinal points of the compass. The twelve zodiac signs have their counterpart in the world calendar, since the twelve months are easily related to the twelve signs. The calendar follows pure mathematics in its arrangement, works in harmony with astronomy, and its qualifications aid yearly computations in the fields of science, economics, mathematics, and agriculture.



See new Chromium Plated "Yankee" Tools Just out!

Mechanics use "*Yankee*" Push Drill

"YANKEE" Tools are made for convenience, for speed, for working capacity. They save the man; his labor. Give service; long wear. Pay dividends on their cost every time you use them: the cheapest in the end.

Mechanics use the "Yankee" Automatic Push Drill because it is quick and sure! Makes the right-size hole for the screw, doesn't split the wood, and clears hole of chips.

Eight "Yankee" drill-points in handle arranged for quick, easy selection. Sizes from 1/16" *to* 11/64". Each drill-point individually tested!

Always Like New . . . Chromium Plating over nickel now used on all "Yankee" Tools, at no increase in price.

No. 10.— "Yankee" Ratchet Screw-driver. 2" to 12" blades.

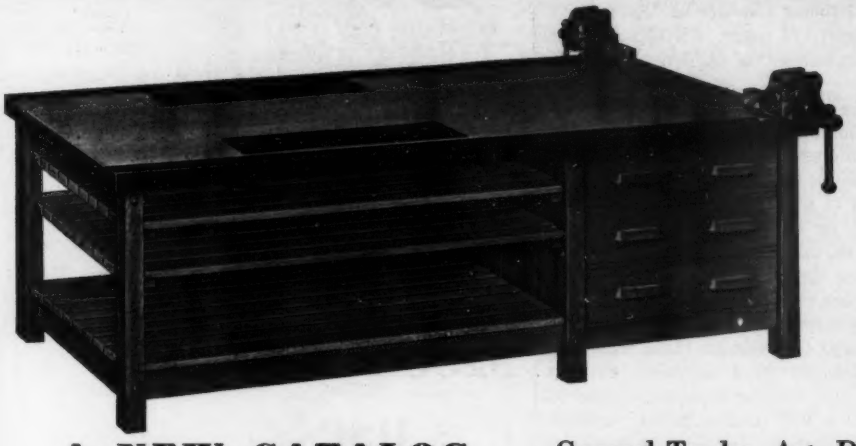
No. 41.—"Yankee" Push Drill. Companion tool to "Yankee" Spiral Screw-driver, in the hands of mechanics the world over. Price, $2.00.

No. 44.—"Yankee" Push Drill with Adjustable Tension for boring in hard or soft woods, with large or small drills. Price, $3.15.

"YANKEE" TOOLS

MAKE BETTER MECHANICS

NORTH BROS. MFG. CO., Philadelphia, U. S. A.
You may send "Yankee" Tool Book (offered in Industrial Arts)—Showing Spiral and Ratchet Screw-drivers, Automatic Push Drills, Ratchet Braces, Socket Bit-Extensions, Ratchet and Plain Breast and hand drills, Automatic Chain and Bench Drills, Ratchet Tap Wrenches, Continuous-Work Swivel Vises, Plain Screw-drivers, Etc.
(Please clip and write name and address in margin below)



General Shop Plumbing *and* Sheet Metal Bench

One of the attractive new designs illustrated in the new Sheldon Catalog.

A NEW CATALOG
Just Printed
300 Illustrations, 600 Designs
of
Sheldon Furniture
for
Cooking, Sewing, Manual Training, General Trades, Art, Drawing, Commercial, Library Departments, Cabinets and Cases to match.

WRITE us what kind of furniture you are considering, and we will deliver the catalog covering your requirements.

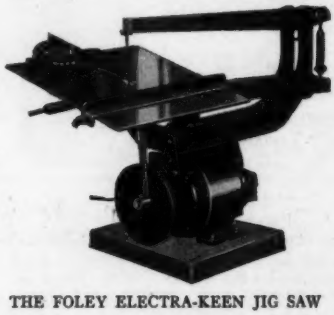
E. H. SHELDON AND COMPANY, Muskegon, Michigan

School Shop Equipment News

For the Supervisor or Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

NEW FOLEY ALL-PURPOSE POWER SAW

The Foley Manufacturing Company, 11 Main St., N.E., Minneapolis, Minn., has just announced the marketing of a small all-purpose electric power saw, which involves a new principle in saw design. The saw which is called the Foley Electra-Keen jig saw, is driven at high speed on a short stroke,



THE FOLEY ELECTRA-KEEN JIG SAW

directly from the shaft of a ¼ h.p. motor. It has a patented counterbalancer and silencer, mounted on the end of the motor shaft, to which a connecting rod is attached for reducing vibration and insuring smooth cutting at high speed.

A special feature is the device for drawing away from the cut on the upstroke, which prevents back drag and reduces the tendency of the saw to raise the wood from the table.

A 12-in. tilting table of cold-drawn full-hard steel rigid and accurate in operation, has been provided. An extension screw under the center of the table locks it at any desired angle up to 45 degrees to the right, or 15 degrees to the left. A ¼ h.p. motor operates the jig saw at a speed of 1,750 strokes per minute. It has special large bearings at the armature end to stand up under the reciprocal motion of the jig saw, and a fan which blows the dust out of the motor. A built-in switch and rubber-covered footcord and nonbreakable rubber plug are provided.

The Foley all-purpose saw is simple in design, efficient in operation, economical in price, and may be used for a variety of purposes. Complete information and prices will be sent to any shop instructor upon request.

ANNOUNCE WADDELL BOOK OF PROJECTS

The Waddell Manufacturing Company, 1135 Taylor Ave., N. W., Grand Rapids, Mich., has announced the Waddell Book of Projects, containing a wide variety of designs of furniture for construction in the school shop. It aims to place before the student furniture projects which are easy to build and which, when completed, will have the finished look of fine commercial pieces.

The booklet offers sketches, working drawings, and directions for the construction of tables, bookcases, telephone cabinets, footstools, mirror frames, plant and smoking stands, table-lamp stands, and wall sconces. The last part of the booklet contains several pages of descriptions of carved moldings and wood turnings for use in woodworking projects.

(Continued on Page 20a)

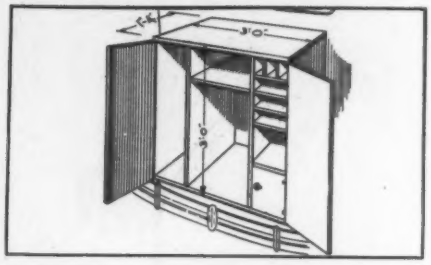
Parents will be proud of these useful PLYWOOD PROJECTS!

—*And they COST NO MORE than ordinary lumber jobs!*

STUDENTS become *enthusiastic* over the variety of attractive projects they can afford to make with Douglas Fir Plywood! They build both for beauty and permanence with this "Engineered Lumber" — yet even elaborate pieces such as bookcases, cabinets and secretaries are well within their means.

Inexpensive though Douglas Fir Plywood is—costing less per surface foot than any other lumber—it is one of the strongest of materials. Even the thinnest panels are as rugged and enduring as much greater thicknesses of solid wood, so that Fir Plywood projects are unusually light in weight and graceful in appearance. Best of all, perhaps—these crack-proof, split-proof, warp-resisting panels are truer-working than ordinary lumber. Students build faster with Douglas Fir Plywood, with fewer errors and less lumber waste.

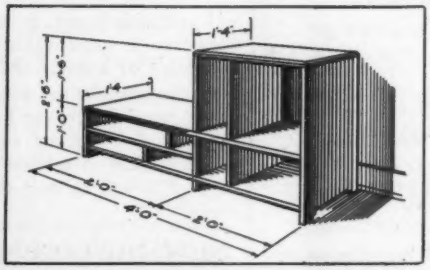
Your local lumber dealer can now provide you with a full assortment of Douglas Fir Plywood for your classes—*at current low prices*—including panels as big as 4 feet by 8 feet and in thicknesses from 3/16″ three-ply to 1-3/16″ seven-ply. * * * For free working plans and perspective drawings of instructive projects for your students, send the coupon below.



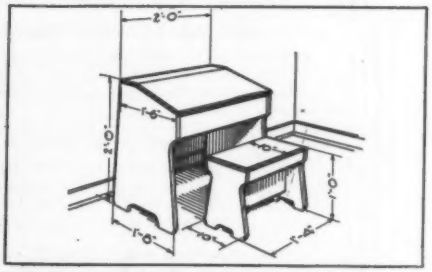
AUTO CAMP KIT FOR REAR OF CAR: Light, easy to build — yet ready for years of hard service if made of Douglac Fir Plywood. Students can start building this now for spring outings.

IRONING BOARD BUILT-IN: A real home convenience, not difficult to make. Doors and walls easily cut from single-piece plywood panels. No extra bracing needed.

Big Panels of True-working Lumber — in sizes up to 4 feet wide and 8 feet long



SIDE TABLE: An inexpensive Douglas Fir Plywood project. May be painted, stained or lacquered in many effective color combinations.



CHILD'S DESK AND BENCH SET: Can be built quickly for Christmas gifts, withstands hard use, is light and easy to carry about.

DOUGLAS FIR PLYWOOD

REAL LUMBER
Engineered for greater size and strength

DOUGLAS FIR PLYWOOD MFRS., Dept. 1131-L
Sixth Floor, Skinner Bldg., Seattle, Wash.

Gentlemen: Please send me a sample of Douglas Fir Plywood, and a copy of your new manual training projects, both free.

Name_____

School_____

Address_____

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FOR YOUR GENERAL SHOP

Individual Instruction Units

Make Your General Shop a Laboratory of Industry

This series of pamphlet texts has been carefully edited and well illustrated by men especially trained for this work. Each pamphlet is a complete unit in itself. Leaders in Industrial Arts Education proclaim this material to be the answer for the problem of General Shop texts.

Clear — Concise — Authoritative

Enrich your shop activities with the aid of this adequate teaching material. Your students may then gain a clear conception of technical requirements.

Partial List of Electrical Pamphlets, 5" x 7½"

Fundamental Electrical Instruction	45 pp.	41 illus.	$.35
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Other Pamphlets for Industrial Arts Classes

AUTOMOBILE	FOUNDRY WORK
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The pamphlets are well made and bound in sturdy, paper covers. They fit nicely into the hand and are convenient to use.

Texts are also in book form.

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☐ Please send me on approval your text on the following subjects:
☐ Please send me prices of your text on the following subjects:

I agree to return texts if not adopted or to remit for same.

Name
Position
School
Address

(Continued from Page 18a)

ISSUE CATALOG OF LEATHERCRAFT SUPPLIES

C. W. Dannenhauer, 143 North 4th St., Philadelphia, Pa., has just issued the third edition of its catalog of leathercraft supplies for school shops.

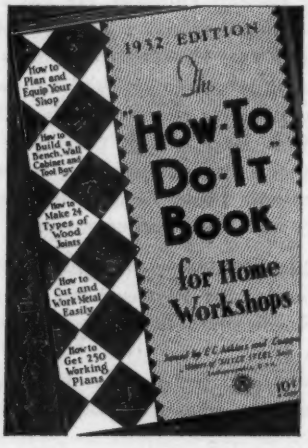
The catalog contains 32 pages devoted to lists of supplies and tools for leathercraft work and a list of cut projects in leather.

The firm also issues a booklet containing samples of leathers for use in leathercraft.

Complete information and prices may be obtained by any school-shop intructor who requests it.

ISSUE 1932 EDITION OF HOW-TO-DO-IT BOOK

The E. C. Atkins Company, Indianapolis, Ind., manufacturers of Atkins steel saws, has just issued the 1932 edition of the *How-To-Do-It Book for Home Workshops.* This booklet of 38 pages is intended to point the way to many happy


1932 EDITION
How-To Do-It Book for Home Workshops
How to Plan and Equip Your Shop
How to Build a Bench, Wall Cabinet and Tool Box
How to Make 24 Types of Wood Joints
How to Cut and Work Metal Easily
How to Get 250 Working Plans

and profitable hours, in responding to the call of the home workshop. It gives valuable hints on the planning and arrangement of a home workshop, the selection of the proper tools, the selection of woods for different purposes, the making of wood joints, the building of shop outfits, the cutting and working of metals, and types of saws and their uses.

The booklet is interesting, understandable, and usable. A copy of it will be sent to any school-shop instructor upon request.

NEW DIETZGEN CATALOG OF BLUE-PRINT SUPPLIES

The Eugene Dietzgen Company, 2425 Sheffield Ave., Chicago, Ill., has just issued the fourteenth edition of its catalog of drafting-room, blue-print supplies, surveying instruments, and measuring tapes. The catalog also contains a list of scientific books.

NEWS NOTES

Manitowoc Offers Scholarships to Boys and Girls Over 14 Years

Four scholarships given by the Wisconsin State Board of Vocational Education for boys and girls over 14 years of age

(Continued on Page 22a)

LEADERSHIP

IN THE INSTALLATION OF
PRINTING IN ALL KINDS OF SCHOOLS

More than three thousand schools have installed printing equipments during the last twenty years. Practically all installations were made by the American Type Founders Company. There are several good reasons for this preferment

• First of all, this Company is a nation-wide organization with twenty-five Selling Houses carrying a complete line of type, printing equipment and supplies. Each of these selling houses can furnish promptly to any school within its territory any required item, from a gauge pin up to a Kelly Automatic Press. Only an organization like the American Type Founders Company is in a position to render such satisfactory service with promptness and dispatch.

• In the second place, American Type Founders Company has been the preëminent leader in the printing industry in designing practical type faces of both classic and modern styles, and in developing a splendid line of printing machinery and equipment to meet ever increasing demands for efficiency in production.

• Finally, a high standard of business ethics and integrity requires that every customer shall receive the very best service possible in the way of expert advice relative to his particular requirements. To this end, and realizing that school printing laboratories present problems differing from those of commercial printing plants, an Education Department is maintained, with a staff of experienced educators, from whom any school may receive reliable counsel in planning and organizing its printing department. By means of this service, which is rendered without charge, school officials may obtain an efficient layout showing how the proposed printing equipment should be arranged to secure best results in instruction, together with specifications of every item required to equip the plant properly.

When considering the installation of a new school printshop or the addition of materials for an existing shop, write to

EDUCATION DEPARTMENT

American Type Founders Company

300 Communipaw Avenue, Jersey City, N. J.

This advertisement is set in Stymie Types, a showing of which will be sent upon request.

YOU WILL BE AMAZED

AT THE REMARKABLE QUALITY BUILT INTO

The New Delta Double-Duty Drill Press

ACCURATE–POWERFUL–SENSITIVE–CONVENIENT

No matter how small your appropriation, you can now afford the drill presses your shop needs. For the New Delta Double-Duty Drill Press is not only a remarkable all-around tool, but sells at a remarkable price.

Consider these features: Heavy, husky quill, graduated for depth drilling, and provided with adjustable pointer for accurate gaging. Perfectly balanced, ball-bearing spindle with lubricant sealed in. Spindles easily and quickly changed for special jobs. Independent ball-bearing drive pulley takes belt pull away from spindle, permitting free, sensitve operation, and avoiding misalignment and wear. Six speeds. Self-tightening chuck, $\frac{5}{64}$" capacity. Heavy, well-ribbed table, slotted for clamping work. Table tilts through full 360 deg., yet is instantly and positively returnable square with spindle. Automatically lubricated idler pulleys.

Used for either wood or metal work, this drill press will quickly prove its value in any shop, large or small. Boring, routing and sanding in wood done as easily and efficiently as metal work. Let us tell you how.

BALL-BEARING SPINDLE "FREE-FLOATING" TYPE

FULL ½" CAPACITY

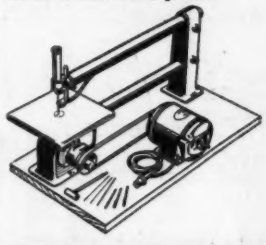
GRADUATED QUILL

SIX SPEEDS

HEAVY RIBBED AND SLOTTED TABLE

NEW DELTA 24-INCH SCROLL SAW

And then there is the New Delta 24-inch Scroll Saw, another tool that no shop can afford to be without. There is no scroll saw at anywhere near its price that will do the many things it will do, and that has such a tremendous capacity. Write for information and prices.



48-PAGE CATALOG NOW READY

The new edition of the Delta Catalog, with its 48 pages of thoroughly illustrated description of QUALITY TOOLS for the workshop, is now ready. Teachers will find it a mine of information on the very latest in workshop machines. Precision machines at prices that meet any appropriation. Send for your copy now.

DELTA SPECIALTY COMPANY

(Division of Delta Mfg. Co.)

Dept. BP1131—3775 N. Holton St.—MILWAUKEE, WIS.

(Continued from Page 20a)

who cannot attend school full time because of the expense, will be awarded in Manitowoc this year. The scholarships amount to $15 per month for ten months and they may be used in any way that permits the deserving student to attend full time.

Cizek Christmas Cards

The Austrian Junior Red Cross has issued a new set of Christmas cards made by pupils of Professor Cizek in Vienna. A set of ten cards will be sent upon receipt of 27 cents sent to the Austrian Junior Red Cross, 1 Stubenring, Vienna, Austria.

Welders' Conference at Madison, Wisconsin

A welding conference, planned for engineers, designers, and operators in industry, was held at the University of Wisconsin, October 8, 9, and 10. The conference was in charge of Prof. J. M. Dorrans, of the College of Engineering, and Prof. B. G. Elliott, of the University Extension Division, and the program comprised lectures, demonstrations, exhibits, and other worth-while features of interest to welders.

Students Seek Special Training

Supt. William J. Bogan, of Chicago, Ill., in a recent statement, showed that, of 45,000 boys in the senior high schools, 50 per cent are taking some kind of shopwork, and 60 per cent some kind of drawing. More than one third of the girls have enrolled in commercial courses, so that the trend of the girls' interests is distinctly toward business. Superintendent Bogan pointed out that a good many students who left school without having had vocational or commercial courses, have returned to the special schools in order to obtain this special training.

New Site for Industrial-Arts Shops

The school board of Sacramento, Calif., has obtained a site for the industrial-arts shops of the city schools. The new building will replace an old structure formerly used for the purpose. The site comprises 12,000 sq. ft., and was purchased for $6,676.

New Courses at the Cleveland Trade School

The Cleveland Trade School at Cleveland, Ohio, opened with courses for journeymen in the mechanical and building trades. Blue-print reading and job planning were added to the courses offered.

Extension Course in Teacher Training

The board of education of Sioux City, Iowa, has coöperated with the Iowa College Engineering Extension Service, in conducting an extension course in social significance in industrial education to a class of public-school teachers. The course carries three quarter credits, and is of graduate-undergraduate rank. Where the student has not been previously registered in the graduate college, graduate credit will not be given until the student has enrolled for at least an equal amount of resident graduate study. Among the subjects covered in the course are guidance, social and economic relationships in industrial education, problems of educational administration, and fundamental methods.

Two-Week Alternating Plan in Pennsylvania

A number of schools in Pennsylvania are conducting their unit-trade and industrial programs on the alternating two-week plan. Under this plan, the students spend two weeks in the school shop, and two weeks in the academic and related classes. Among the districts which have undertaken the plan are Monessen, Norristown, and Pottstown.

The plan provides for an easy introduction from the unit trade into the coöperative plan. Students can be placed at any time, during the school year, that industry can take an apprentice under the plan. When students are unemployed, the school organization provides a plan whereby they can be taken care of with unit-trade students.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Volume 20 DECEMBER, 1931 Number 12

Industrial Arts and Vocational Education in the Convention City

*Howard A. Shiebler**

OUTSTANDING among the special schools that delegates to the annual convention of the American Vocational Association will wish to visit during their stay in New York City over December 9, 10, 11 and 12, 1931, are:

The new Textile High School at East 9th Avenue between W. 18th and W. 19th Streets, Manhattan;

The Brooklyn Industrial High School for Girls at Pacific Street and 3rd Avenue, Brooklyn;

The Manhattan Industrial High School for Girls at 22nd Street and Lexington Avenue, Manhattan;

The Brooklyn Technical High School at Flatbush Avenue, Extension and Concord Street, Brooklyn.

In the continuation-school group, there are:

The East Side Continuation School at Oak, Oliver, and James Streets, Manhattan;

The Central Printing Trades Continuation School at 240–248 West 40th Street, Manhattan; and

The Needle Trades' Continuation School at Greeley Arcade Building, 128–36 West 31st Street, Manhattan.

*Secretary to the Superintendent of Schools, New York City.

New York City has many other technical, vocational, industrial, and continuation schools, but the foregoing are those at which most is to be seen in the relatively short time the delegates will have.

Textile is the newest of the special schools and is probably the largest textile high school in the world. It was erected at a cost of more than $3,300,000 and provides accommodations for about 3,000 students.

The new building is centrally located in the heart of the wholesale textile district and convenient to all parts of the city. It is half a block from the 9th Avenue elevated line, half a block from the new 8th Avenue subway, a block and a half from the Broadway-Seventh Avenue subway, and only a short distance from the 14th Street crosstown subway.

The aim of the school is to train boys and girls for leadership in the textile and related industries. New York City is the leading style and textile center in the United States, and the new school, of which William

THE NEW SAMUEL GOMPERS INDUSTRIAL SCHOOL FOR BOYS NOW UNDER CONSTRUCTION AT WALES AND TINTON AVENUES, THE BRONX

THE NEW BROOKLYN TECHNICAL HIGH SCHOOL AT FT. GREENE PLACE, SOUTH ELLIOTT PLACE AND DEKALB AVENUE, BROOKLYN
When completed, probably for the fall term of 1932, Brooklyn Technical will be the city's largest high school, accommodating 5,500 boys. School will cost between four and five million dollars.

H. Dooley is principal, is one of the best equipped in the country. The students receive academic and technical instruction underlying trade, art, and business practice. The courses of study provide for an intensely practical education for the worker as well as for much liberal or academic training. The technical instruction especially has been carefully planned so as to really train for leadership.

There are courses of study in buying, selling, advertising, etc.; electrical and mechanical engineering; the supervision and operation of machinery, repairwork and mechanical drafting; chemistry and dyeing, designing of fabrics; interior decoration; costume and wearing apparel; general textiles; and graphic arts.

Before planning the new building the board of education submitted the plans to a committee of textile men. This committee passed upon the practicability of the plans and the building was designed upon their recommendations.

The building is seven stories high, and its architecture reveals a modernistic touch. Among the features of the interior decoration are murals showing the history of clothing and the development of the textile art in the various civilizations.

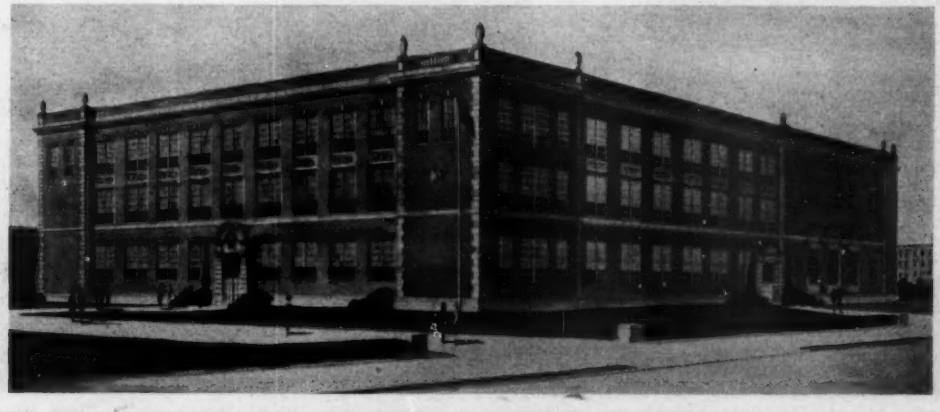
Two museums of textile art are found in the new building. Trade organizations dealing in fabrics and wearing apparel have presented books, pictures, and literature, as well as samples of fabrics and wearing apparel, for use in the museums.

There are special classrooms for the marketing and salesmanship, special electrical appliances for the teaching of window dressing, and rooms for instruction in office practice, accounting, correspondence, typewriting and stenography, with reference to the textile trades.

The shops are equipped with the latest full-sized machines, and the laboratories with the latest devices.

The building has the usual gymnasium, swimming pool, and physical-training rooms.

Walter C. Martin, school architect, designed the



THE NEW BRONX CONTINUATION SCHOOL NOW UNDER CONSTRUCTION AT 157TH STREET AND 3RD AVENUE, THE BRONX

CLASS IN JOB PRESSWORK—APPRENTICES FROM JOB AND COMMERCIAL PRESSROOMS, CENTRAL PRINTING TRADES CONTINUATION SCHOOL

building and the principal, Dr. Dooley, is well known in New England as the organizer of textile schools in Lawrence, Lowell, and Fall River, Mass.

Recent enrollment figures show a total enrollment of 4,827 boys and girls. The school provides day and evening classes.

The Brooklyn Industrial High School for Girls, which may be reached by either the BMT or IRT subway lines to downtown Brooklyn, is the newest and largest of the city's industrial high schools for girls. At this school there are courses of study in everything from beauty culture to tea-room management, and the purpose of the school is to provide every girl with an immediately marketable skill.

Approximately 1,600 girls are registered at the present time.

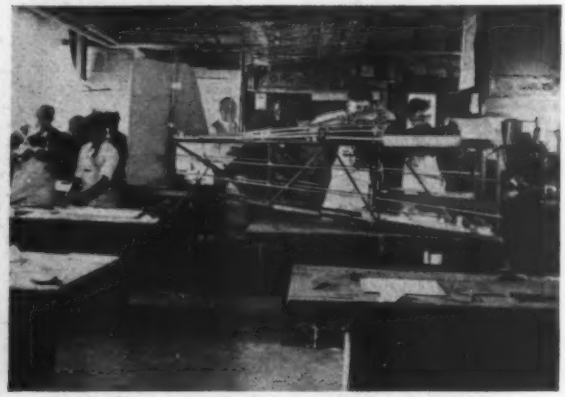
Housed in a building of modernistic architecture, the new Brooklyn Industrial High School for Girls represents a total expenditure of $1,867,000 for the building and its equipment.

The building contains 19 classrooms, a laundry, three elementary dressmaking rooms, eight advanced dressmaking rooms, a hair-dressing and manicuring room, a library, a store for the sale of various student products, a food shop in which cake and candy are sold, three novelty shops, two power shops, a design and draping room, cafeteria and auxiliary rooms, auditorium, gymnasium, roof playground, lunchrooms, restrooms, and the usual offices, filing rooms, and storerooms.

The course of study extends over a period of two years which may be lengthened to three.

The principal of the school, Miss Margaret Jones,

VOCATIONAL GUIDANCE FOR AUTOMOTIVE TRADES, BROOKLYN BOYS' CONTINUATION SCHOOL



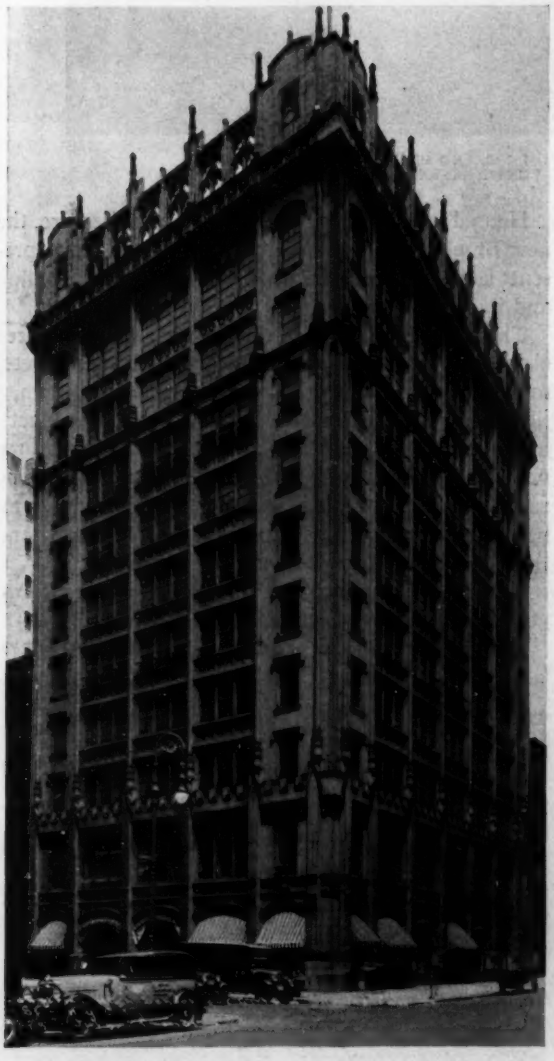
TRYOUT FOR AIRPLANE WORK, BROOKLYN BOYS' CONTINUATION SCHOOL

makes periodic surveys of the occupational opportunities existing in the community served by her school and the courses of study are adjusted to train the students to take advantage of these opportunities.

The girls are taught, among other things, dressmaking, millinery, artificial flower making, construction of novelties; the power operating trades, including garment-machine operating, hat-machine operating, and embroidery-machine operating.

Health education is stressed. Ability to "carry on" is the most valuable asset the girls have, and since this ability is possessed only by those in good health, health education occupies a prominent place in the curriculum; and this is true not only in the Brooklyn Industrial High School for Girls, but in all the schools.

Associate Superintendent Joseph M. Sheehan, in charge of Industrial Schools, has stated that the aim of the Brooklyn Industrial High School for Girls is "to provide every girl with a definite skill of instant applicability and marketable value."



MANHATTAN TRADE SCHOOL FOR GIRLS, LOCATED AT 127 EAST 22ND STREET, MANHATTAN

THE ELECTRICAL LABORATORY IN THE NEW TEXTILE HIGH SCHOOL LOCATED EAST OF 9TH AVENUE BETWEEN W. 18TH AND W. 19TH STREETS, MANHATTAN

The Manhattan Industrial High School for Girls, reached by taking the Interboro Subway to 23rd Street, is quite similar to the Brooklyn Industrial High School for Girls. The building is older but the equipment and courses of study are very much the same. Florence M. Marshall is principal.

This school, which is permitted by legislative enactment to sell the finished products of its pupils, sold more than $11,800 worth of goods during 1930.

Brooklyn Technical High School, soon to be housed in one of the largest school buildings in the world is at present in temporary headquarters at Flatbush Avenue and Concord Street, Brooklyn. Visitors may reach this school by motor by driving across the Manhattan Bridge or by taking the BMT subway to Myrtle Avenue. The new building now under construction is within walking distance and is at DeKalb Avenue and Fort Greene Place.

Brooklyn Technical High School is a school that has rarely been able to meet the demand for its graduates. The principal, Dr. Albert L. Colston, takes the view that this is an industrial age and that it is the function of his institution to train young men for the age in which they live. The school offers the highest type of technical training.

ANOTHER VIEW OF THE ELECTRICAL LABORATORY IN THE NEW TEXTILE HIGH SCHOOL, MANHATTAN

FUR CUTTING CLASS, CENTRAL NEEDLE TRADES SCHOOL

So great is the call for the special training offered by Principal Colston's school that hundreds of applicants for admission were turned away this term. The school now has an enrollment of about 5,000. Even in its temporary quarters the school is one that attracts hundreds and hundreds of boys every year.

It offers courses of study in aëronautics, radio broadcasting and navigation, in addition to the usual technical courses. Its shops are many and the equipment is modern.

To meet the demand for technical training, the city is now erecting at a cost of more than $5,000,000 a new building for Brooklyn Technical. Construction of this building has reached the stage where a good general idea of the size of the school may be had on a visit to its site.

The new building will be 550 ft. long and 190 ft. wide. It will have 230 rooms, including 62 typical classrooms, 21 special rooms for music, lectures, hygiene, study, etc.; 37 rooms devoted to drawing, and 40 shops with additional rooms for lectures. Notable among the shops is the aviation repairshop, the building construction shop, where the students learn among other things how skyscrapers are erected. There are 7 miscellaneous shops, 1 foundry, and 35 rooms devoted to executive administrative offices.

Before planning the new building for the Brooklyn Technical High School, Principal Colston visited nearly every large technical high school in the United States and a number of those abroad.

Of the fifteen continuation schools, the East Side, the Central Printing Trades, and the Needle Trades are probably the most interesting from the standpoint of out-of-town visitors.

There are at the present time approximately 92,000 students registered at continuation schools.

Service has been extended not only to unemployed minors, but to unemployed adults as well. During the past summer in both the East Side Continuation School and the Harlem Continuation School the number of adults wishing to enroll exceeded the capacity of the shops.

New York has recently provided a new building for the Queens Continuation School, and the Bronx Continuation School is in course of construction. The new Bronx Continuation School will cost more than $1,000,000 and will have a pupil capacity of 1,330. There will be an employment office at the school under the direct supervision of the State Department of Labor.

For the girls, there will be courses of study in bookkeeping, office practice, salesmanship, stenography and typewriting, homemaking, machine operation, personal hygiene, etc. For the boys, there will be an automotive

ONE OF THE MUSEUMS OF TEXTILE ART AT THE NEW TEXTILE HIGH SCHOOL, MANHATTAN

CLASS IN HAND COMPOSITION, PRE-APPRENTICES, CENTRAL PRINTING TRADES CONTINUATION SCHOOL

shop, an auto-ignition shop, carpentry shop, commercial-art rooms, plumbing, printing, electric wiring and electric light and power shops. This school, which is

THE BROOKLYN INDUSTRIAL HIGH SCHOOL FOR GIRLS, LOCATED AT PACIFIC STREET AND 3RD AVENUE, BROOKLYN

located at 151st Street and Morris Avenue, will open in February, 1932.

Construction is under way for a new continuation school on Staten Island. This school will be a combined continuation and vocational school and will cost about $1,000,000.

Plans are now being made for new buildings for each of the following:

The Central Needle Trades Continuation School; the Williamsburg Continuation School; the Central Printing Trades Continuation School; and a new continuation school for Queens.

Interesting among the new industrial schools is the Samuel Gompers Industrial High School for Boys that will open next term. This school will be a type school exclusively for electrical training.

Its students will learn about the manufacture of electrical appliances; about Neon lighting; about manual and automatic telephony; and about bell wiring, burglar alarms, and annunciators. They also will be instructed in the installation and operation of electric elevators; in the installation, maintenance, and upkeep of electrically operated oil burners; in the upkeep and servicing of electric refrigerators. They will also study the upkeep and servicing of other household electrical appliances, such as vacuum cleaners, flatirons, and electric heaters.

There will be a comprehensive course in radio, including broadcasting, reception, and repair and servicing of the radio apparatus itself.

The training necessary to obtain either a commercial operator's or a ship operator's license in wireless telegraphy will be given.

The course will include also armature winding, study of the motor, the dynamo, the generator, and the storage battery.

There will be two main shops, one for instruction in the care of electrical equipment and the other an automachine shop. The students will be given a thorough knowledge of the part played by electricity in the operation of automobiles.

The total cost of new vocational, industrial, technical, and continuation schools now under construction or on planning tables of the city of New York exceeds $14,000,000 and the total seating capacity of these schools is more than 17,000.

BUY CHRISTMAS SEALS

The money that you expend for Christmas seals helps to promote:

1. Health inspection of school children.
2. The teaching of good-health habits.
3. The fighting of tuberculosis in time to effect cures.
4. The establishment of sanatoriums for treating tuberculosis.
5. The bringing of rest, good food, sunshine, fresh air, and medical attention to sick children.

Can We Justify Vocational Education?

*J. R. Hawke**

DURING the past year, there has been a tendency on the part of certain individuals and organizations within the field of general education to take exception to the policies of the Federal Board for Vocational Education in particular, and the whole vocational program in general. Those of us engaged in the development of vocational education should not feel that this is a reflection on our program. Any educational project should be able to justify itself not only to those people actually engaged in the work, but also to those who are affected by it.

Vocational education, in one form or another, has been in existence ever since man and woman first started to work. Since that time our civilization has passed through a number of logically successive stages of development. We are now living in an age of industrial, agricultural, and commercial activities which has resulted in many people saying that the world is moving along too rapidly. There is no doubt that wonderful progress has been made since the Civil War, in our social, commercial, and industrial life.

The invention of the first machine, whatever it may have been, was a notable event in the history of the world. The machine plays a very important part in our life today. It does man's work much more quickly and efficiently than he can do it himself. A study of the social changes in our civilization during the past 75 years will show that our educational progress did not keep pace with other developments, which situation is being slowly but surely adjusted today.

Vocational education as we know it, now has been included in the general educational program for only a comparatively few years. Previous to the formation of the Federal Board for Vocational Education, a small handful of progressive people had been trying to bring the public schools into tune with the trend of the times. They were fought bitterly from pillar to post and back again, but some of their ideals were realized. The vocational movement was given national recognition and financial support.

In industry, when one method of manufacture proves to be better than another, a change is made immediately. In agriculture, when it has been proved that potatoes will not grow in certain soils, potatoes are no longer planted in that kind of soil. In education it is somewhat different. Even if an old-established educational method did not function properly under changing conditions, it is not apt to be discontinued, and those who advance new ideas and new methods are often looked on askance. This does not mean that all educators are ultraconservative. Our wide-awake educational administrators really strive for efficiency.

The Federal Board for Vocational Education, in organizing its program and setting up its standards, did not follow a one-sided policy. It recognized the fact that there were many people in the fields of commerce, industry, and agriculture who were interested in educational policies, and those people were invited to share the responsibility of working out the new program. Thus we find that a cross section of the school and working population was used as a basis for making a change in educational practice. That logical and sane procedure of the federal board is in itself a justification of vocational education because it was a definite advance in educational procedure.

Those of us who believe in the philosophy of vocational education and who try to "practice what we preach" can point to the efficiency of our program as a justification of its existence and continuation. Vocational programs are efficient because they are flexible and because of the high standards that are set up and actually maintained. The student and the community, in the case of adult education or part-time education, receives immediate benefit from the instruction because the information given "tonight" may be put into practice "tomorrow." The instruction supplements daily employment and the daily working experiences of the worker serve the purposes of school shops and laboratories. Vocational class instructors use the practical past experience of the learner as a basis for class procedure.

Whether we as school people like it or not, we must set up standards that are acceptable to industry. If the standards of the workaday world are higher than ours, we can only raise ours. If ours are higher, we can train a better worker than is asked for.

The December, 1930, issue of the *American Federationist* contains an article on the trade-school graduate prepared by R. D. Fleming, of the New York State Education Department. His study shows that three-fourths of 2,060 students who were graduated from New York Trade Schools during 1929, followed the trades in which they received instruction. These are truly remarkable statistics, yet many other communities can show evidence of even better educational efficiency for vocational projects.

The following factors, recognized by all vocational people, will show why vocational education is efficient and effective.

1. The training is given to selected groups of individuals who definitely expect to use the knowledge and skill gained in earning a living.
2. The instructors are occupationally competent and can effectively teach what they know and can do.
3. The objectives for each stage of the training are clearly defined and thoroughly understood.

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4. The necessary facilities for carrying on the training have been provided.
5. The working conditions are sufficiently favorable to make it possible to do a good job of training.
6. The instructional content is practical and teachable.

One might say that all of these factors should be considered as a basis for justifying *any* educational program. Whether this is accepted or not, the fact remains that such factors as have been mentioned form the backbone of vocational education.

Vocational people have often been accused of trying to develop a project that has very narrow limitations. In this connection, let it be understood first of all, that no elementary or secondary educational program is complete if it does not include vocational activities commensurate with local conditions, and secondly, that the extent to which vocational activities are limited or expanded is determined by the policies of the local school administration.

A well-developed vocational program touches a great many phases in the field of general education. In addition, it makes contacts with employers and employees and with those other coöperating agencies, that is, family welfare, juvenile clubs, settlement houses, children's service bureaus, etc., to the end that they feel they are coworkers in the scheme of education.

It may be taken for granted that the high schools are doing a good job as far as preparing boys and girls for college is concerned. Here we find that the colleges have set up very definite standards which must be met by the high-school graduate if he plans to attend a high institution of learning. Whether or not the standards set up by the colleges are just is another question. The fact remains that a small number of our total school population moves from high school to college without much friction. They have been trained with a particular purpose in mind.

What about the future for that great majority of boys and girls who do not go to college? Does the ordinary academic program actually prepare these boys and girls for the serious business of earning a decent living? These two pertinent questions must be answered if we are to justify the whole educational program of today. It is not the vocational program alone that must defend itself.

By proving that vocational education is an important phase in the field of general education, we can justify its existence. One has but to observe the effectiveness of proper training that will be found in those communities that have whole-heartedly adopted the vocational aspect in education to realize its value.

In Pittsburgh, Pennsylvania, may be found an excellent example of the growth and value of a vocational program. Originating in a very modest way and growing slowly under very adverse conditions, that particular vocational program is being considered more and more by the teaching and administrative personnel, as well as the laymen, as a very necessary and essential part of their whole scheme of education. This desirable attitude has been brought about because the vocational program has demonstrated its ability to readily adapt its activities to meet the situation of the hour and to plan for the future. It is now in a position to capitalize on the investment of coöperation which has had much to do with its development.

The many developments and activities in the field of vocational education, in Pittsburgh and elsewhere, refute the accusation that the program has narrow limitation. Surveys of vocational education tend to show that many of the principles and methods which are vocational in character are being adopted by progressive educators in other fields.

The February, 1926, issue of the *Vocational Guidance Magazine* is devoted to a detailed discussion of a vocational guidance program. That issue of the magazine is called the Pittsburgh number, because it deals exclusively with the development and success of the Pittsburgh guidance plan.

Guidance, although it is very important, is only one phase of vocational program. Various types of vocational schools are also included, as are adult education, prevocational courses, related academic subjects, coördination, counseling, research, occupational surveys, and placement. Vocational education, through the medium of its various component parts, does much to broaden the scope of experiences in which any boy or girl may participate.

Arthur Dean, while lecturing to a group of vocational teachers attending a well-known teacher-training institution during the summer session of 1925, asked this question, "Do you consider yourselves to be professional people?" The remark was inspired by his having heard many prominent educators question the standing of vocational teachers on the basis of preparation. Although there was absolutely no defensible reason for a misunderstanding of that nature, it was known that there was some feeling in the matter.

The ensuing discussion resulted in a determination on the part of some of the class members to investigate the various vocational teacher-training institutions. It soon became evident that there were only two types of schools to be studied; namely, those that complied with the standards set up by the Federal Board for Vocational Education and those that did not.

In comparing the two types of schools one very important point was discovered. The schools that adopted the Federal Board standards were teaching that *methods* and *content* went hand in hand. The other group assumed the point of view that these matters were to be taught independently of each other. Many curricula were scrutinized on these foundations and the advantage lay with the schools that were really training vocational teachers, that is, the schools setting up Federal Board standards.

The underlying philosophy needs no explanation. It takes a well-trained craftsman to teach a trade. When a skilled workman has been trained as a teacher, his occupational background is just one more reason why he should be eligible to enter the "profession."

The many activities in which vocational education participates bring us in contact with two distinct and separate groups of people. We meet boys and girls of school age, and men and women of the adult group. On the one hand, we have set up a number of plans, primarily to teach occupational content, while on the other, we have been engaged in supplying occupational information.

It is being realized more and more that adult education must be adequately provided for in any general plan of education. It is not enough to say that our obligations have been canceled when the boys and girls have been graduated from the public schools. New materials, new tools, and new methods are being constantly introduced into industry, commerce, agriculture, and the home. One purpose of vocational education is to provide facilities whereby the worker may keep himself informed of occupational changes and progress.

Whenever men or women who work during the day are willing and anxious to spend some of their free time attending vocational classes, you may be sure that they do so for a very definite reason. If they did not receive some actual benefit from the classwork they would not attend. Those educational administrators who are responsible for vocational programs are impressed with the rapidly increasing demand for adult classes and the wide diversity of subjects that can be profitably studied.

The people who attend the classes for adults have, as a rule, the right to vote and to voice their appreciation or disapproval of our educational programs. All of us should be glad, if for no other than selfish reasons, to have the moral support of the citizens in the community. As long as we make an honest effort to meet the needs of our individual communities we can expect their support. Vocational education is a means of accomplishing this result.

Only very recently a newly inaugurated state governor instituted an economy program. Listed among the various activities that are to be curtailed, should the economy measure be approved by the legislature, is vocational education. As soon as this matter came to the attention of the men and women enrolled in the many vocational adult classes that are in operation, they took immediate steps to secure disapproval of the governor's economy program as far as this particular phase is concerned. The action of this group of voters may influence a more favorable attitude in the legislature toward vocational education.

The city of Havelock, Nebraska, has a vocational program which includes a part-time project. In coöperation with the Burlington Railroad, 48 part-time students are being trained in the railroad shops, several highly skilled trades being represented in the training program. By the simple device of joining hands with the Burlington Railroad Company, the Havelock High School has made available for the training of 48 Havelock young men in highly paid skilled trades, the enormous shop equipment of the railroad company. It has also made available a large amount of practical productive work within the trades involved, from which the students may secure training and experience.

This huge laboratory with its shop equipment and material is secured by the school system at no cost to the school or the community. The school could never hope to provide these shop facilities, even on a miniature basis, for the training of these young Havelock people. However, it can and does supply the technical related subject matter which is closely related to and coördinated with the trade experience within the shop.

A million dollars worth of equipment and materials is now available for instructional purposes in Havelock. The local school board is only obligated to pay the salaries of the instructors and to see that modern educational methods are used.

In Omaha, Nebraska, the present vocational program is comprised of a continuation school and adult class, but a much more comprehensive program is being planned. During the 1930–1931 school year the total active enrollment will be approximately 3,000 persons and each person will have received an average of sixty hours' instruction. The total cost of this project, including instruction and supervision, will be $20,000.

Vocational education is specific education and in general it may be said that it functions at a time when it is needed. Part-time and coöperative programs, continuation schools, all-day vocational schools and adult classes are effective because they afford an opportunity for the learner to get what he needs as he needs it. This is especially true in the case of the adult in night-school work. The learner is given what he wants, needs, can use and profit by on his daily job. It cannot be classed as "long-term" education. When capital in the form of a person's time is invested in vocational education, immediate dividends are realized.

Life itself is an education and we learn as we live. Would it not be much better to correlate our educational processes with that point of view? Vocational education has been on the offensive along this line for at least fifteen years, and if forced to take defensive action its supporters can point with justification to its worthiness.

TITLE PAGE AND INDEX FOR VOLUME XX NOW AVAILABLE

A title page and index for Volume 20 of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION has been prepared for the readers who bind their magazines. A card addressed to the publishers at 407 East Michigan St., Milwaukee, Wis., will bring a copy.

Industrial Arts for Rural Communities

*F. Theodore Struck**

WITHIN the past ten or fifteen years, and more particularly within the past five years, industrial-arts education has made notable progress in the United States. Developing hand in hand as an essential and integral part of the junior-high-school movement, though by no means limited either to that form of school organization or to the grades or school years therein represented, industrial-arts education is growing in a very encouraging manner. It has, however, developed most rapidly, in the main, in the larger towns and cities as distinguished from the small towns and the open country — and hence this article.

The fact that the various forms of practical-arts education, including industrial-arts education, are not found as frequently in the open country and in the smaller town as in the larger municipalities, is due to a variety of circumstances, some of which are quite obvious and others of which are not so generally known. Among the more self-evident causes lying back of the retarded development of industrial-arts education in rural districts may be mentioned: (1) lack of adequate funds; (2) limited housing facilities; (3) small enrollments; (4) shortage of teachers with adequate special training; and (5) insufficient information as to how best to overcome, in part, some of the more serious handicaps to the development of industrial-arts education in such smaller communities.

Farm-Shop Work

Since the passage of the National Vocational Education Act of 1917, vocational agricultural education given under public auspices has increased in the United States from a very insignificant program to one enrolling in the year ending June 30, 1930, a total of 188,311 pupils in federally aided classes and an additional 5,014 taught in schools or classes operating under state plans without federal aid. As a part of this training in the field of vocational agricultural education, both "farm-shop work" and "farm machinery" are taught to the pupils enrolled in the agricultural-education curriculums. Farm-shop work, so called, deals essentially with the kinds of construction and repairwork that farmers perform as a part of the job of farming; it draws its inspiration, its content, and standards of accomplishment directly from what constitutes good farm practice. This is another way of saying that farm-shop work, as taught as a part of agricultural curriculums of secondary, or of less than college grade, is a form of shop instruction that is distinctly *vocational* in aim. The reason for here injecting these seemingly extraneous comments about farm-shop work will shortly be explained.

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In the larger or wealthier school districts where progressive educational developments are less hampered by serious fiscal, physical plant, and professional limitations, it is quite customary to provide, during the seventh, eighth and ninth school years, varied offerings in practical-arts education. Among such may be mentioned: (1) general home economics for girls and (2) industrial-arts education for boys. All of this practical-arts training is given from the standpoint of *general* education; it is given in order to develop appreciations of what the world is doing in its great and confusingly varied manufacturing and industrial enterprises; it is offered to provide try-out and exploratory training for pupils, and it is made available in order that it will to some extent simplify the difficult problems incident to selecting life careers. In other words, in school districts where the curriculums approach the ideal, industrial-arts education with its fascinating exploratory and try-out opportunities is given as a background or foundation training on the basis of which vocational choices — either partial or rather complete and definite — are made *before* the more specialized vocational education is undertaken.

Now, to return to the case of farm-shop work previously mentioned, the situation is often quite the opposite. Exploratory and try-out shop courses frequently do not precede farm-shop work which, as has been mentioned, is clearly vocational in aim. The typical relatively poor rural district has been unable, despite its best intentions and its strenuous efforts, to see its way clear to establish and to conduct industrial-arts education. There seemed to be no funds that could be spared for that purpose. Then the National Vocational Education Act of 1917 became a reality and under its stimulating provisions and with the aid of additional state funds many rural communities were for the first time able to expand their educational offerings beyond the barest of basic groups of courses. So it was plainly logical from a financial and administrative standpoint to offer farm-shop work — a form of definite, vocational agricultural education — prior to giving industrial-arts education — a form of general, prevocational education.

From an educational standpoint, that is putting the cart before the horse, the plow before the tractor, and the caboose before the locomotive. In theory at least we believe that it is highly desirable in our bewilderingly complex civilization to give youth try-out and exploratory training before a vocational choice is made and prior to undertaking school training that is vocational in its objective, methods, and practices. This apparently paradoxical situation has developed to no small extent, and it represents, in reality, a very practical adaptation to existing circumstances. Surely no

one familiar with what is being done in the way of vocational education for the farmer can deny the social, economic, and cultural advantages that have already accrued as results of the public program. There should therefore be not the slightest cause for regret or resentment that vocational education has sometimes preceded certain forms of general education such as industrial-arts education in grades seven, eight, and nine. While such practice cannot be regarded as logical for the larger towns and cities, it certainly is logical in some rural districts. Communities, like persons, have their individual differences.

Dual-Purpose Shops

The development of an educational program may well, at times, be downward as well as upward. For example, in some school districts kindergartens are introduced after higher grades have been in operation for years; in others, for reasons that were deemed good and sufficient, industrial-arts education follows the introduction of certain phases of vocational education, such as farm-shop work. The latter once in operation makes it easier than before to offer industrial-arts instruction for reasons that will now be mentioned.

The ideal *farm shop* as set up for school purposes is patterned after the real construction and repair shop that is found on successful farms. It is not a carpenter shop, not a blacksmith shop, not a machine shop, not an electrical, sheet-metal, nor auto shop, but very clearly a "general" or a "composite" shop in which the instructor teaches boys how to make or to repair all sorts of farm appliances, tools, equipment and paraphernalia ranging from rope and harness work, on the one hand, to projects involving woods, metals, and various other materials. Now such a shop is almost ideal for teaching industrial arts in grades seven, eight, and nine, or any portion thereof. It will need to be supplemented to a certain extent with some equipment and materials not used in farm-shop instruction but in the main the farm shop can well serve more than its vocational purpose. In the smaller schools, particularly, the farm shop is not in constant use. To give industrial-arts instruction in it will in no significant way interfere with the vocational program as long as the enrollment is not too large. On the contrary if industrial-arts instruction be provided before the boys take up farm-shop work, they will be able, as a result of the shop skills developed and because of the body of related knowledge acquired in the industrial-arts work, to do better than they otherwise would in farm-shop work. More valuable, educational, than the technical knowledge gained and the manipulative skills developed through shop work given on the industrial-arts level, is the wealth of general information that is gained about materials, tools, processes, design, modes of living, transportation, manufacture and commerce that a well-designed program of industrial-arts education offers in addition to the try-out and exploratory training. Such forms of education as these, it is, that the country boy needs quite as much as his city cousin. We cannot afford to assume in this day and age, as may have been quite appropriate in previous generations, that because a boy is born in the open country he should therefore become a farmer. A certain amount of industrial-arts education helps very definitely to make more appreciative and more intelligent consumers; it adds directly to personal culture, to social understanding and to economic insight. No matter what vocation the boy will later follow it still is believed to be true that he will be a better representative of that vocation — be it agricultural, industrial, commercial, or professional — than if he had not been given the opportunity to get industrial-arts training as a part of his general, prevocational education.

The Next Step

The next step, then, in enriching the curriculums in many rural districts may well be to develop industrial-arts education. Where the farm shop is provided, the matter is simplified greatly though it by no means solves the whole problem. Who, for instance, shall teach such courses? In some cases the instructor of farm-shop work has the necessary qualifications; in other instances he does not have them. There appears to be at least two ways of meeting the teacher problem. The first, and usually the best method, is to upgrade the teachers on the job. This can be done through summer-session courses and in some instances through having the teacher work as a learner in given occupations. The general plan involved is to have the teacher in service add to his "bag of tricks" so that he can teach both industrial-arts courses and farm-shop work. That can readily be done by those who want to do so provided they have average or better ability. The second way is to employ teachers who at the outset are qualified to conduct both types of shopwork. At the present time they are relatively scarce, but that is only a temporary condition that can soon be remedied.

The foregoing discussion has assumed that the teacher of farm-shop work can have his teaching schedule modified so that he will have time to devote to industrial-arts instruction. In point of time, probably, that could be fixed at two hours per pupil per week. There will be instances where this will be hard to arrange. Even in large cities special provisions must sometimes be made so that the limited shop facilities will extend to all eligible pupils. In schools where the vocational curriculums begin during the ninth year, industrial-arts instruction may be given as a required subject during the seventh and eighth years only. If circumstances permit, it could be given also as an elective in the ninth year and beyond. In addition to this, various forms of industrial-arts education can serve as the basis of extracurricular or club activities.

Industrial-arts education is so fascinating to pupils of junior-high-school age and can be made to contribute so much educationally, socially, culturally, and economically that the promotion of such offerings in rural, as well as urban communities, should be a matter of public concern.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

THE ANNUAL CONVENTIONS

The season for educational conventions is again at hand. There are a great many of them if we consider them as a whole. The individual teacher, however, is not so likely to have occasion to attend more than one or two. He has neither the time nor the money to participate in more. Because of this, each one of these conventions must be made as educational as possible, for that is their purpose. Some associations have fallen into desuetude in the past, because they lost sight of this important point and the more serious members revolted because they no longer were reaping benefits that were comparable to the time and money which had to be spent by those who attended.

The conventions of the larger educational and teacher associations, however, cannot be criticized for injecting too much irrelevant matter into their convention programs. Most of them take a very serious view of the function and the convention programs reflect this. However, to some extent at least, all conventions have to suffer in expiation of the sins of the past, and it is not uncommon to hear even old and experienced educators voice the opinion that they expect to get more out of their contacts with the other men who attend than from the programs presented.

These men quite frankly state that they attended very few of the sessions and that most of their time is spent out in the corridors discussing common problems with visitors from other cities or other states. Taking their cue from these old and experienced educators, many of the younger teachers get the idea that attending a convention in this way is quite proper.

No doubt, these contacts with men from other cities and states is very broadening, and every possible opportunity should be used to gather experience in this way. It should not be done at the expense of the rest of the programs, however. The officers upon whom devolve the task of planning the program for a large convention have no sinecure. They go to a lot of trouble and usually to quite an expense to secure nationally known experts for the program. It is therefore only natural that these officials feel chagrined and disappointed if but a small audience gathers at the appointed time to listen to the address. It is not uncommon that important speakers who really have a message to deliver, refuse to speak if the group which they are to address is too small. They cannot be blamed for their attitude, because it takes time and effort to prepare a speech, and any group that is so discourteous as not to attend a program arranged by its own officials is not worth the consideration of extra labor. True, the few who attend and are disappointed have a real grievance, but this ought not to reflect on the speaker but on their own indolent and short-sighted fellow members.

Teachers who do not attend at least a fair number of the general and sectional sessions at their educational conventions should remember that they are not whole-heartedly supporting their organization. By their absence at round-table conferences they are selfishly withholding their own experiences from fellow educators who may sorely need them. In this way, they are really hampering the growth of their profession. They may also be depriving themselves of getting news of the latest advances made by someone else who is not afraid to impart to others what he has found helpful to himself.

There is, however, another valuable point to be considered. If an educational authority, or, in fact, if any expert in any field comes to the conclusion that he knows so much that he can learn nothing more from the experiences of others, then he is not only in grave danger of losing his position of authority, but he already is started on his way toward oblivion.

ESTABLISHING PROPER HABITS OF ASSOCIATION

William H. Burnham, in his book *The Normal Mind,* emphasizes the importance of developing the right habits of association in the student. For the shop teacher this means that the student must not only be shown the proper tool manipulation for doing a certain operation, but he must be carefully supervised until he has made the proper application of this information. Otherwise he may always associate the wrong method with the carrying out of that particular operation.

Some students are so constituted that their processes of thought are largely indirect. A person thus afflicted, if once habituated to associate the wrong method with a given act, will henceforth be troubled whenever that act is required of him, because the erroneous association will come to mind first, even though he knows it to be wrong. It is like a little child that has been told to say "yes," not "ya." Whenever she is about to use this expression, she invariably says "I mustn't say 'ya,' I must say 'yes.'"

Mental interferences of this kind frequently are the cause of errors. The wrong association coming to mind first, may produce a strong enough impression to cause action before the correct association is formed. Thus a student may mentally say "I must not do this by the wrong method" and then proceed to do it by that method unconsciously, simply because the erroneous association has come to mind first.

While not all persons are so constituted that, once having formed a wrong impression, it will ever after obtrude itself, yet with some persons it is bound always to happen while it is possible to happen in every case.

Since this is true, the teacher has to take special care in his presentation methods. Incorrect ways of accomplishing results must be carefully avoided, and salient points in the correct method emphasized, so that the student is able to form associations which will function correctly in his future life. If this is to be effected, the shop teacher will readily see how necessary it is for him to prepare his instructional materials

and his demonstrations with utmost care. Failure on his part to recognize this important point may do much to increase the large number of industrial workers, who because of the inefficiency brought about by mental interferences of one kind or another, form the driftwood which clutters up the labor market, and constitute the majority of those who make up the population of our penal and charitable institutions.

REHABILITATION OF THE DISABLED

This new phase of vocational education, the rehabilitation of the disabled, is making commendable progress. No other form of vocational education requires the solution of so many and such difficult problems as this newer type of humane educative endeavor.

The rehabilitation of the disabled soldier was difficult enough, but when he was prepared for a new occupation, the patriotic appeal could be made to the employer so that the entry into industry could be made a little easier for the rehabilitated ex-service man.

For the civilian rehabilitated worker who has been trained for a new occupation, no such argument can be used. Instead, the humanitarian phase of the problem must be stressed, only to be met in too many cases by the retort: "Why should we take care of the cripples produced in this or that industry? Let them take care of their own disabled workers."

Fortunately, however, as the work performed by the schools is becoming better known, and as employers are getting more confidence in the type of work that is accomplished, coöperation is more easily secured. The problems confronting the administrators of this type of education, however, are still very complex. Each rehabilitation case must be treated individually. Each one of these unfortunates presents a practically new problem. Not the least of the job is to thoroughly sell the patient on the new venture. His confidence must be gained, his ambition roused, his tenacity of purpose continually bolstered up, and finally his courage brought to the point where he is willing and ready to start in a field that is new and unfamiliar.

Then there are the cases of the skilled worker who has been demoted, as it were, by his injury. No longer will he be able to carry on in his own skilled occupation with its high standing and its acceptable wage. Instead, the new venture must be made in an occupation that can be carried on by semiskilled or even unskilled workers. His fellow workers no longer will be mechanics who are proud of what they can do. He must accept smaller wages than he has been accustomed to, and must compete with able-bodied men who frequently are not adverse to taking advantage of his disability, if they can profit by it. These obstacles must not only be recognized by the rehabilitation contact man, but he must prepare his charge to meet and surmount them.

Of course, the work of those engaged in this rehabilitation work also has its recompenses. The feeling of exhilaration which must come to an invalid of 24, who because of infantile paralysis has never been able to do any work, and now suddenly draws his first week's pay because he has had an opportunity to prepare himself as a watch repairer, can hardly be imagined by a person who possesses all his faculties, and to earn and receive the gratitude of such a man is a thing amply worth while.

The Federal Board for Vocational Education and the rehabilitation workers in the various states are therefore to be complimented on their fine work. They rehabilitate about 5,000 of these disabled workers annually, and give them an opportunity to face the world as self-sustaining members of the human family. May their achievements increase.

COORDINATING THE FORCES

More and more those in administrative positions in the school field find that educational questions need to be considered, not only in the school, but also with interested groups outside of the institutions of learning.

Especially is this true of industrial arts and vocational education. It is not enough for the school superintendent, the supervisor, and the teacher to know the objectives underlying the work given in the school shop. These objectives must also be accepted and understood by the community at large. It is not uncommon to hear business executives complaining bitterly that boys who have finished the shopwork given in a junior high school, possess exceedingly little trade skill, and that the employers must train these beginners all over again when they enter industry. Evidently these critics look upon the junior high school as a trade-preparatory institution. They show by their very words that they have failed entirely to understand the reason for which shopwork is given in schools of this kind. The world at large is full of those who do not understand, and it is therefore exceedingly important that the work of the school and the reasons for that work be ever kept before the public eye.

When the question of actual trade training in the school is attempted, far-sighted school executives have learned the value of discussing their aims and aspiration with both interested employer and employee groups. Committees of members from these various groups are asked to assist in the work of formulating the plans and perfecting the organization which is required to carry on the work in the school shop. This at once definitely aligns all interested parties on one side of the question. In this way, all chance of misunderstanding is avoided and the school is in a position to strive for the goal which it has set, knowing that its work will be understood at least by those who are to profit by it.

Unless school leaders adopt this method of aligning interested groups with the school program, misunderstandings may be expected. What is of more importance, however, unless all of these interested forces are working together toward a common goal, friction will result, and no matter how well the school's work measures up with its objectives, much opposition and adverse criticism will result.

Occupational Representation in a Vocational High School

J. Harold Goldthorpe and Albert A. Meinhold***

WITHIN recent years a number of investigations have revealed the intimate relationship between the economic status of the family and high-school attendance of children. Among these studies that by Counts[1] is the most recent and indicated that high schools in urban centers are serving mainly the children of the favored social and economic classes, particularly those whose parents are engaged in the professional, proprietory, commercial, and managerial services. The present report is a part of a study[2] which has for its purpose an analysis of the factor of occupational representation in a specialized vocational high school in an industrial city.

In February, 1930, data were gathered from 539 students of the Elm Vocational High School concerning the occupations of their fathers. This response based on the number of usable replies constituted approximately 90 per cent of the school's total enrollment. A plan of uniform procedure was devised and was followed in securing the desired data from the 33 homerooms or "roll-call" groups. This plan was adopted from Counts' technique in modified form and was administered to all groups by the writers.

A few words should be said about the character of the school and its offerings. The Elm Vocational High School is a school of secondary level for boys administered under the requirements laid down by the Federal Board for Vocational Education and the state department of education. It was formally chartered in 1929 by the state as an industrial vocational high school and now offers several courses which are four years in length. The four occupational lines for which training is supplied are: printing, composition and presswork; aircraft construction and repair; automobile repair; and machine-shop practice. At present about a tenth of the registration is enrolled in trade lines beyond the second year. The courses are essentially of a practical character leading directly to occupational entrance and most of the work is about equally divided between shop and laboratory practice and academic classroom activity in the related subjects. It is one of four vocational high schools operated by the Buffalo Board of Education.

Three fifths of the students enter direct from elementary schools, slightly over one fifth transfer from high schools, and the balance come from parochial schools and schools outside of Buffalo. Approximately one half of the students are sons of foreign-born parents, although 96 per cent of the pupils are native-born. In age these students present about the same picture as high schools in general, 96 per cent of the group falling in the age span 14 to 18 years, inclusive.

The essential facts with respect to the percentages of the total student body which are from the various social-economic levels as determined by the occupation of the father are presented in Table I. The classification of occupations which was developed and used by Counts[3] was employed. For comparative purposes, similar percentages for the high schools of the four cities, Bridgeport, Conn., Mount Vernon, N. Y., St. Louis, Mo., and Seattle, Wash., are included. These latter data were collected during the years 1919, 1920, and 1921.

Two important factors must be borne in mind in interpreting these figures: first, the difference of about 10 years between the periods when the data were gathered and, secondly, the fact that the figures for Elm Vocational High School are those of but one of

TABLE I. Comparison of the Occupations of Fathers of 539 Students in Elm Vocational High School with Similar Data for High-School Students of Four Large Cities in 1919–21

	Occupation	*Elm Vocational High School 1930*	*High Schools of Four Large Cities 1919–1921*[4]
I	Proprietors	....	19.8%
II	Professional Service ...	.4%	9.4
III	Managerial Service	5.4	16.5
IV	Commercial Service ...	1.7	9.5
V	Clerical Service.....	2.1	5.8
VI	Agricultural Service ...	1.7	2.4
VII	Artisan Proprietors....	9.6	4.2
VIII	Building Trades.....	9.6	7.7
IX	Machine Trades	24.1	7.1
X	Printing Trades.....	1.7	1.1
XI	Miscellaneous Trades..	11.7	3.8
XII	Transportation Service.	12.2	4.9
XIII	Public Service	2.3	1.6
XIV	Personal Service	4.2	1.4
XV	Miners and Quarry Men	.4	.4
XVI	Common Labor.....	12.2	1.2
XVII	Occupation Unknown..	....	3.2
	Total	100.0%	100.0%

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**Burgard Vocational High School, Buffalo, New York.

[1]Counts, George S., *The Selective Character of American Secondary Education* (Chicago: University of Chicago Press, 1922).

[2]Meinhold, A., "A Study of the Social-Economic Composition of the Student Body of a Vocational High School." Unpublished thesis for the degree of B.S. in Education, University of Buffalo, 1930.

[3]Counts, G. S., *op. cit.*, pp. 22–23.

[4]Counts, G. S., *Selective Character of American Secondary Education*, p. 26

four differentiated vocational high schools. Thus, the comparison is between the situation which obtained in high schools approximately ten years ago and that which is found in a specialized vocational school at the present time. With these limitations in mind it is believed that the figures present some worth-while comparisons.

It is obvious that the composition of the student body in Elm Vocational High School is drawn from quite different economic levels than those of the high-school groups studied by Counts. There were no students from the proprietory level in the Elm group, while almost one fifth of Counts' high-school students were from that economic stratum. Less than one half of 1 per cent of the Elm group were sons of fathers engaged in professional service contrasted with approximately one tenth in the Counts investigation. In a like manner there are wide discrepancies in the representation from the managerial, commercial, and clerical-service groups.

When the skilled-trade-and-labor groups are examined the contrasts are likewise very striking. The occupational level with the largest representation in the Elm group was the machine and related-trade level which included approximately one fourth of the student body. This is in direct contrast with the high-school groups in which but 7 per cent had fathers who were engaged in the machine trades. The common-labor and the transportation-service groups accounted for 12.2 per cent each of the students in the vocational group as contrasted with 1.2 per cent and 4.9 per cent, respectively, of the high-school groups in the Counts study. These three occupational levels, machine and related trades, transportation service, and common labor include 48.5 per cent or approximately one half of the Elm student body as against 13.2 per cent or slightly over one eighth of the students in the high-school groups of the four cities.

The disparity of representation of the various occupational levels is shown more emphatically in Table II in which the figures of the preceding table are grouped in three major categories. These three groups are the nonlabor group which includes the proprietory, professional, managerial, commercial, and clerical services; skilled labor comprising the nine levels listed in Table I under the Roman numerals VII and XV; and common labor. The percentages listed under the three groups do not quite total 100, since the figures for the agricultural group and those reported by Counts as "occupation unknown" are not included.

TABLE II. Perentage Comparison of Father's Occupation in Three Major Groups

Group	*Elm Vocational High School*	*High Schools of Four Large Cities*
Nonlabor I–V	9.6%	61.0%
Skilled Labor, VII–XV.....	75.8	32.2
Common Labor, XVI	12.2	1.2

The five nonlabor occupational levels comprise less than one tenth of the Elm student body as contrasted with approximately three fifths of the student body of the high schools in Counts' four cities. This contrast is more striking when it is understood from Counts' analysis and estimate[5] that these five occupational levels include 40 per cent of men 45 years or over who are engaged in gainful occupations in the four cities. The skilled-labor occupations contribute three fourths of the vocational students and less than a third of the high-school students. At the other extreme, the common-labor groups in the four cities studied by Counts comprised almost one seventh of the adult men 45 years and over, but this occupational level contributed only 1.2 per cent of the high-school students. This figure is but one tenth of the proportion of vocational students contributed by the common-labor groups.

Comparison with Similar Studies. Van Denburg,[6] in an early study, found that the economic status of the family as indicated by the monthly rental was but a minor factor influencing retention in high school. Holley's[7] investigation, included an analysis of the influence of several factors, such as the rental value of the home, real estate assessment, personal-property assessment, and the number of rooms per person and showed that these indices were significantly related to retention in high school and in these middle-sized Illinois cities the length of stay for students whose fathers were engaged in professional and commercial pursuits was greater than for those pupils whose fathers were engaged in the skilled, semiskilled, or common-labor occupations.

Counts' investigation, to which considerable reference has already been made, has indicated the intimate relationship between parental occupation and its influence on high-school attendance. In the conclusion of his report he stated:

"These differences (due to economic status) in the extent of educational opportunity are further accentuated through the choice of curricula. As a rule, those groups which are poorly represented in the high school patronize the more narrow and practical curricula, the curricula which stand as terminal points in the educational system and which prepare for wage-earning. And the poorer their representation in high school, the greater is the probability that they will enter these curricula. The one and two-year vocational courses, wherever offered, draw their registration particularly, from the ranks of labor."[8]

Conclusions

The results of the present limited study are in agreement with the foregoing quotation. Despite the fact that there is ten years' difference in the dates when

[5]Counts, G. S., *op. cit.*, pp. 31–33.
[6]Van Denburg, Joseph K., *Causes of the Elimination of Students in Public Secondary Schools of New York City* (New York: Teachers College, Columbia University, 1911), p. 113.
[7]Holley, Charles E., *The Relationship Between Persistence in School and Home Conditions.* Fifteenth Yearbook of the National Society for the Study of Education, Part II (Bloomington, Ill.: Public School Publishing Co., 1916).
[8]Counts, G. S., *op. cit.*, p. 143.

the data were collected, and that there has been a great increase in the numbers attending high school in this period and the fact that the comparison is between two types of schools essentially different in character and traditions, it would seem reasonable to believe that a vocational high school of the type in the present study is supplying a form of training to large groups whom present high schools are doing relatively little to reach. Here is an additional reason to assume that vocational education on the high-school level is an important factor to democratize education for more diverse social and economic groups.

Tests as an Aid to Supervision

*Harry B. Nash and Roy R. VanDuzee**

IN recent years a great deal of time and money has been spent in formulating objectives in industrial arts, also in preparing shop-course sequences and courses of study which are intended to bring about desirable changes in students so that the determined objectives shall have been realized at the conclusion of the work in the shops.

The better courses of study, whether in the form of outlines, or a series of instruction sheets or charts, are so written that they are a complete guide to the teacher. They give the objectives of the course, the integrated content material, the processes, suggested jobs, the materials and tools, the outcomes, the basic tests, the supplementary reference material, together with the suggested methods of class procedure.

Supervisors and administrative officers who are committed to a program of teaching which involves the gaining of knowledge of construction and materials, insight into trade processes, and a changed attitude toward converting of raw materials into a finished product should be interested in knowing how much of what they set out to attain has been accomplished.

How is it possible accurately to determine pupil acquisitions in skills, knowledge and attitudes? Three possible ways to evaluate pupil achievements are: first, to visit the shops and observe the quality and amount of work being done; second, to observe the student at work and note the technique used; third, to give tests covering the information skills and attitudes that are covered in the course of study. It is possible that the best procedure to follow in evaluating progress is to use a combination of all these three methods, being careful in so doing that objective methods supplant the subjective insofar as that is possible. A combination of the three methods of evaluation is best because observation of the completed product alone tells very little of the correctness or incorrectness of technique used in making the project and reveals little relative to what the boy has learned as to planning the job, reading instructions and drawings, and in integral information acquired in the course.

It is the writers' purpose to discuss the part tests play in the rôle of supervision. Briefly stated, these tests:

1. Show what part or parts of the course have been covered.
2. Show whether or not the sequence of the work has been taught.
3. Show whether hour units are taught according to time periods.
4. Make possible the objective comparison of the work of different teachers.
5. Make possible the objective comparison of the work of different schools.
6. May be used to set standards of achievement.
7. Tend to raise the grade of work done.
8. Make possible the teaching of efficiency.
9. Make possible the evaluation of teachers' procedures.
10. Help to an adequate evaluation of the curriculum.
11. May be used as a partial basis for assigning marks and determining promotion.
12. Aid the teacher in diagnosing teachers' difficulties.

Best results are most likely to be secured by setting up a testing program making use of objective tests. It is understood, of course, that the teacher is free to use tests for inventory and instructional purposes at such time as he may see fit in addition to the tests listed on the program. The plan followed for the past several years in the industrial-arts department of the West Allis public schools with some success is as follows:

The semester is divided into three marking periods of approximately six weeks each. The program calls for a test covering information content and such other work as may be tested on paper at the end of the first six weeks' period, either a paper test or a performance

WEST ALLIS PUBLIC SCHOOLS
Department of Educational Research
TEACHERS' DISTRIBUTION SHEET

Teacher Mr. A — Grade 7A

Subject Home Mechanics — Month First Date March 14, 1931

Sec. 3-4 Pos. Sc. 84			Sec. 2 Pos. Sc. 84			Sec. 1 Pos. Sc. 84			Sec. Pos. Sc.		
Score	Freq.	School Mark	Score	Freq.	School Mark	Score	Freq.	School Mark	Score	Freq.	School Mark
71-70	1	90	77-76	1	95	68-67	1	90			
69-68			75-74			66-65	4	87			
67-66			73-72			64-63	1	86			
65-64			71-70			62-61	1	83			
63-62	1	84	69-68	1	87	60-59					
61-60			67-66			58-57	3	82			
59-58			65-64			56-55	2	80			
57-56	1	84	63-62	1	85	54-53	1	78			
55-54	1	84	61-60			52-51	1	76			
53-52	3	83	59-58			50-49	1	75			
51-50			57-56	2	83	48-47					
49-48			55-54	2	82	46-45					
47-46	1	81	53-52	1	80	44-43					
45-44	2	80	51-50	1	78	42-41	1	71			
43-42	1	79	49-48			40-39	1	70			
41-40	3	78	47-46	1	75						
39-38	2	76	45-44								
37-36	4	74	43-42	2	72						
35-34	1	72	41-40	1	70						
33-32	2	70	39-38								
31-30			37-36								
29-28			35-34	1	65						
27-26	1	60									
25-24											
23-22											
21-20											
19	1	50									

TABLE I

*Mr. Nash is the Director of the Educational Research Department, and Mr. Van Duzee is the Supervisor of Industrial Arts, of the West Allis Public Schools, West Allis, Wis.

WEST ALLIS PUBLIC SCHOOLS
Department of Educational Research
TEACHERS' DISTRIBUTION SHEET

Teacher Mr. D — Grade 7A

Subject Home Mechanics — Month 1st 6 wks. Date March 13, 1931

Sec. * Pos.Sc.84			Sec. 7A1 Pos.Sc.84			Sec. 7A Pos.Sc.84			Sec. ___ Pos.Sc. ___		
Score	Freq.	School Mark	Score	Freq.	School Mark	Score	Freq.	School Mark	Score	Freq.	School Mark
73	1	90	75	1	92	69	1	84			
70	1	88	74	1	91	68	1	83			
69	1	84	67	1	84	66	1	82			
66	1	82	66	1	83	59	1	80			
65	1	80	64	1	81	54	1	78			
64	2	78	63	1	80	53	1	76			
63	2	76	62	2	79	52	1	74			
61	1	73	61	2	78	50	1	70			
60	2	72	59	1	77	35	1	56			
58	1	70	57	1	76						
25	1	50	54	1	74						
			51	1	72						
			47	1	70						
			33	1	55						

*McKinley Junior High School

TABLE II

test at the end of the second marking period, and a final examination at the end of the semester. The six weeks' tests are constructed by the teachers either working individually or as a committee. The final tests are either local tests made by a committee of teachers who teach that work, or by the supervisor, or they are standardized tests. It is the policy of the department to use standardized tests periodically in such shop courses where they are available. The testing work is a part of a city-wide program, headed by the educational research department.

In instances where the committee plan is followed the several teachers first work independently, making up sets of questions based upon types of questions previously agreed upon. Through committee work the questions are consolidated, revised, and checked against the course of study. The six weeks' marking-period tests are given to the classes, scored, and a distribution sheet is made out by the teacher which shows the section taking the test, the possible score on the test, the range of scores, the frequency of students scoring at certain intervals, and the school mark assigned the pupil. The distribution sheet, accompanied by the copy of the examination given and a key used in marking the tests, is sent to the supervisor's office.

Two such distribution sheets are shown in Table I and II. It will be observed that Mr. A. records his scores by intervals, while Mr. B. merely records the scores as obtained by the various members of the class. The column marked "frequency" shows the number of pupils who got that particular score or scored within the interval. The school mark is obtained by placing the mark of 78–80 at the median score or opposite the interval in which the median score falls.[1] The highest school mark is fixed according to how near the best score is to the possible score, taking into account the abilities of the group, the difficulty of the test, and the standard being held to. The failing point is placed at a point where a break occurs in the scoring as at interval 32–33 for section 3–4 in Mr. A's distribution; and score 58 in the McKinley group in Mr. B's distribution sheet. School marks for the intermediate scores are assigned proportionate values. The section numbers 1, 2, and 3 refer to ability groups based on I.Q's and scholastic achievement.

The test results have been of great value to the teacher before he has sent the record to the supervisor, in that they have definitely aided the teacher in showing pupil progress, disclosing learning difficulties of students, providing a basis of determining whether or not a student should proceed to the next unit of work, furnishing an objective record upon which marks may be wholly or partially based, and furnishing a record of individual and class achievement.

Of what value are these tests and records to the supervisor? They show:

First, the total range of work covered during that marking period.

Second, the range of achievement by sections for the several teachers in various schools.

Third, what standards are accepted by the teacher in the various sections.

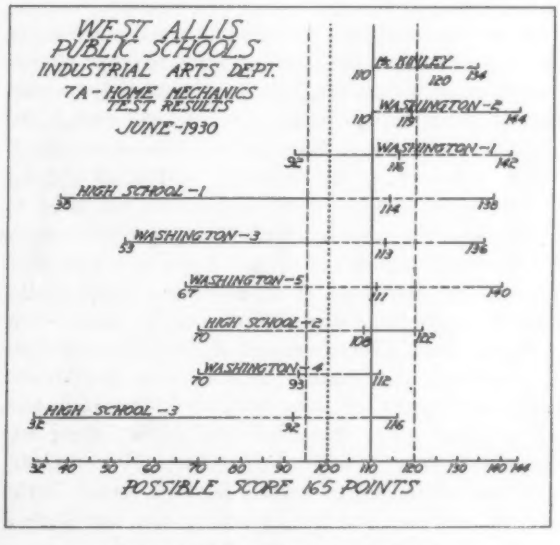
Fourth, the school mark given by the teacher for a given achievement as measured by the test.

We have here then an instrument that is very valuable to the supervisor inasmuch as it shows him how well the instructor has covered the course of study, what the sequence of teaching has been and how effectively the teaching has been done. If the teaching has been done under different conditions as to shop facilities or methods the results are indicative of what may be expected under those conditions.

It is interesting to note in Tables I and II how closely the results of the two teachers compare for the various sections and how similar the school marks assigned for the various scores, are, despite the fact that the marks were assigned independently.

The performance-test results show equally valuable results as to the skill in the use of basic tools and the speed with which the student can perform the basic operations.

The final examinations are handled through the department of educational research. If locally constructed



GRAPH SHOWING FINAL TEST RESULTS

[1]For a full account of the method, see article by the authors on page 166 of the May, 1931, issue of this magazine.

tests are used the examinations are either made up by teacher committees or by the supervisor. Standardized tests are selected by the director of educational research and the supervisor. The final examinations are not given by the teacher of the class, but are scored by him using a key furnished him and from which he under no circumstances may depart. Distribution sheets for the final are returned to the department of educational research and school marks are issued from that department based on the distribution of all classes using the test. It will be remembered that for the six weeks' marking periods the teacher has set his own standards and assigned marks as he saw fit.

The results of a final test may show results as illustrated by the accompanying graph. The long lower horizontal line represents the total range of scores secured by all groups. The shorter horizontal lines represent the range of scores of the various classes taking the test, the solid lines showing the complete range of scores for the class and the broken lines showing the scores of the middle 50 per cent. The class number refers to the ability grouping — group one being the highest section. The long broken vertical lines represent the spread of the middle 50 per cent, the heavy vertical line the median for the 7A class as a whole, and the dotted vertical line represents the norm on the test based on several semesters' use of the test. Medians for each class group are indicated by short vertical lines running above and below the class-group line.

Such a graph shows at a glance the city results for the semester and raises many supervisory and teaching questions. It will be noted in the first instance that the city median in this testing is thirteen points higher than the city norm. Section for section the Washington-school groups rank higher than the high-school groups. Why does the Washington 1 group fall below the achievement of the 2 group? Is the class very large? Is the equipment inadequate? Why the unusually high median score of the McKinley group?

The use of the above supervisory help has made it possible to make comparisons of many kinds within the system. When the test used is a standard test, then the comparison can be carried outside of the school and the work of the school system compared with the achievement in representative schools throughout the country.

In conclusion it will be seen that tests play a very important part in the supervision of work. With a picture of what has been done in hand, a plan may be inaugurated to remedy the situation, where there is need for it. Then, too, the uses of tests and the interpretation of the results will form the basis for the evaluation of methods and the curriculum, also in determining questions of the proper size of classes for each kind of work, and the like.

A Survey of Printing Education in the United States

*David Gustafson**

DURING the early months of 1930, Mr. Fred J. Hartman, director of the department of education, sent questionnaires, similar to those used in the previous survey, to teachers and administrative officers in the American schools known to be offering instruction in printing. The following is an analysis of the answers received from more than five hundred schools which coöperated in the project. The time allowed for the study of the individual reports was too brief to make possible a careful follow-up with specific requests for the interpretation of certain items of information which were ambiguous or appeared to contain statistical errors. Hence, many of the figures set down below are only rough approximations of the real conditions. Furthermore, the number of schools in the United States and Canada teaching printing is frequently said to be about three thousand; the report, therefore, covers less than one fifth of the schools. However, virtually all of the larger schools are represented in the survey, and the contributing institutions constitute a fair sampling of the important types of schools offering printing in all sections of the country.

The states from which ten or more schools submitted reports were the following: Massachusetts, 72; New York, 54; California, 48; Ohio, 39; New Jersey, 35; Pennsylvania, 35; Illinois, 32; Minnesota, 23; Michigan, 22; Indiana, 20; Kansas, 15; Wisconsin, 12; Connecticut, 10. Twenty-six other states and the District of Columbia sent in from one to nine reports each.

Number and Types of Schools Offering Courses in Printing

The size and importance of the program of printing instruction now carried on in public and private schools can readily be inferred from Table I.

In this table, each school is assigned to only one class, usually that of the highest scholastic level upon which printing is offered. For example, an academic high school also giving junior-high-school work in printing is classified as an academic high school. In a few such cases separate figures were set down for the number of junior-high-school pupils enrolled in the

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TABLE I

Classification	*Number of Schools*	*Enrollment*	*Teachers*
Colleges and Universities	26	940	53
Academic High Schools	161	12,090	211
Technical High Schools	43	3,650	85
Junior High Schools	154	22,696	160
Elementary Schools	42	4,647	43
Trade or Vocational Schools	48	3,555	170
Continuation Schools	12	3,419	35
Part-Time Schools	6	428	19
Schools for the Deaf	12	321	17
Plant Schools	5	236	20
Charitable Institutions	5	204	9
Government Schools	6	118	6
Evening Schools	3	58	7
Total	523	52,362	835

printing classes; these are included in the figures for junior-high-school enrollment given. The number of schools offering courses under more than one classification is indicated in Table II.

Diversity of Instructional Programs and Materials

The complexity of the situation in American printing education is seen in the many types of schools listed in Table I. On analysis, too, the answers regarding such items as length of course, hours per week, subjects taught, textbooks used, and value of equipment reveal wide divergences of aims, programs of work, and teaching technique in each of the major classifications.

TABLE II. Number of Schools Offering More Than One Type of Instruction in Printing

Classification	*Number of schools otherwise classified but having this type of printing course*
Academic High School	12
Technical High School	16
Junior High School	53
Elementary	18
Trade or Vocational	4
Continuation	11
Part-Time	16
Evening	46

As to *length of course* and *hours per week*, the medians for each of the larger classes of schools teaching printing are, roughly, as follows:

12 Teachers' colleges: 36 weeks, 8 hours per week

161 Academic high schools: impossible to determine from figures submitted (450, 400, 300, and 275 minutes per week common)

43 Technical high schools: impossible to determine (15 and 7½ hours per week common)

154 Junior high schools: one-half- and one-year courses common, 4 to 5 hours per week

42 Elementary schools: one-half- and one-year courses common; 5 hours per week in many schools

48 Trade or vocational schools: very great diversity; impossible to determine

12 Schools for the deaf: 4 to 5 years, 15 hours per week

Greater uniformity is found in the *subjects taught* in the departments of printing, as indicated in Table III.

Hand composition is taught in all of the schools reporting on this section of the questionnaire, while presswork is almost equally popular. In the schools emphasizing vocational training, bindery and machine composition are common subjects of instruction. A few of the schools offer monotype courses, and one listed Ludlow composition; most of the work in machine composition, however, is offered in the linotype field. Many of the schools state that the bindery work listed is of a very elementary character. The terms "other shop subjects" and "related subjects" were sometimes confused in the answers, but it is clear that very few schools attempt other shop courses than the three types mentioned. A great variety of "released subjects" is offered, but those most commonly mentioned are English, mathematics, drawing and design, proofreading, and science; a few schools list such subjects as linoleum-block cutting, costs and estimating, advertising, art, civics, and others.

Many textbooks and works of reference are in use in the departments of printing. Fifty or more schools mention the following: Polk, *Practice of Printing;* Henry, *Printing for School and Shop; U.T.A. Typographic Library* and Lesson Sheets; and Hague, *Printing Occupations.* Ten to forty-nine schools list the *I.T.U. Lessons;* Henry, *Essentials of Printing;* Levitas, *Printing and Typography for Beginners;* and Spicher, *Practice of Presswork.* Two to ten schools each list works by Mansfield, Thompson, Ginsbach, Loomis, Selvidge and Witt, McClellan, Stilwell, Karch, Hamilton, Lewis, Rogers, Wheelwright, Bohrer, Gress, and Raub. Little information was given as to the use made

TABLE III. Subjects Taught in Printing Departments

Classification	*Hand Comp.*	*Machine Comp.*	*Presswork*	*Bindery*	*Other Shop Subjects*	*Related Subjects*
Colleges and Universities	25	13	24	11	7	15
Academic High Schools	161	29	160	45	18	36
Technical High Schools	43	15	42	25	10	26
Junior High Schools	151	2	146	35	26	53
Elementary	42	0	42	3	2	4
Trade or Vocational	47	28	46	29	15	40
Charitable	5	3	5	1	1	1
Plant	5	5	5	4	4	5
Continuation	12	2	12	4	4	11
Evening	3	2	3	1	0	2
For the Deaf	12	11	12	6	3	1
Government	6	6	6	4	2	4
Part-time	6	3	5	3	4	6
Total	518	119	508	171	96	204

of the volumes mentioned; in many cases, they clearly served as reference works rather than texts. Encouraging facts gleaned from the answers were the increasing popularity of job sheets, the curriculum studies being carried on in several cities, the frequent mention of reference libraries, and the growing tendency to familiarize vocational pupils with the trade journals. Many instructors in printing have unquestionably raised the level of pupil effort from mere practice to understanding and appreciation.

The answers under the heading "Estimated Value of Printing Equipment" are difficult of interpretation, because the question indicated no uniform basis for evaluation. The following figures, however, were presented:

$50,000	and over	23	schools
25,000	to 49,999	23	schools
15,000	to 24,999	42	schools
10,000	to 14,999	43	schools
5,000	to 9,999	101	schools
3,000	to 4,999	139	schools
Less than $3,000		97	schools

The trade or vocational schools generally have the most expensive equipment, with the other larger groups arranged as follows in the order of the estimated value of the equipment of the median school: schools for the deaf, technical high schools, colleges and universities, academic high schools, junior high schools, and elementary schools.

One of the questions pertained to the *relationship of the school to the printing industry* in its community. Only sixty-eight schools indicated that an advisory committee representing the industry was coöperating with the school. Many instructors expressed the wish that such a relationship might be effected in the near future, an indication of the growing realization on the part of teachers and educational supervisors of the necessity of actually fitting the vocational pupil for the industry in which he expects to find his lifework. Trade organizations have assisted a number of the vocational schools in organizing their curricula and obtaining their instructional materials.

. . . . . .

To sum up, the 1930 survey of printing schools and departments of printing gives striking evidence of the growing importance of printing as vocational, prevocational, industrial-arts, and cultural subjects in public and private schools. Considerable progress has recently been made in harmonizing curricula and teaching methods with the expressed aims and objectives of the courses offered. Individualism, however, has run wild in this field, and there is need today of much coöperative effort in the definition of aims, preparation of courses and instructional material, and training of teachers for the various types of schools giving instruction in printing.

Christmas Cards

*Ray J. Matasek**

AT this time of the year most teachers of art are interested in finding some new method for making Christmas cards. There is something about a Christmas card which one has designed and executed himself that cannot be obtained in a commercial card. It is true that commercial cards very often are much more finished than the handmade variety, but the personal touch is missing. The card which shows appropriate thought and individuality is the one which is displayed and treasured by the recipient.

This article is not intended to explain how to make better cards than can be bought, but it will give some hints as to how to proceed with individual design and how to put the design on the card.

The first thing necessary is some sort of motif. A decorative design, a winter scene, a caricature, or some other "Christmassy" idea can be used. The paper too, should be considered as a material factor in the design.

One of the most important things is the arrangement, for no matter how nicely the various parts are drawn, if they are not well arranged, the card will not be pleasing.

The first thing to decide upon is the size and shape of card that is to be used. Cards may be bought complete with envelopes or they may be cut from larger sheets of paper and the envelopes made by hand. After the size of the card has been decided upon, the next thing to do is to make several rough layouts on scratch paper until one is produced that seems to be just right.

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Lettering is a very important factor in the layout and should be treated as an integral part of the design. It should not be stuck on any place after the rest of the design has been completed. It should be in harmony with the motif used and with the spirit of the card.

There should be sufficient white margin. It is a good idea, whenever possible, to leave the largest margin at the bottom of the paper, the next largest at the top, and the smallest margins at the sides. Plate 1 shows how to make these rough layout sketches. After having made several layouts using the same motif, mistakes are quickly seen and the most pleasing arrangement can then be selected.

The composition shown in Figure 1 in Plate 1 is not a pleasing one. There is little variety, as the composition is cut exactly in the middle, horizontally, while the candle cuts the upper part exactly in half. There is no unity, as the lettering is placed too far away from the rest of the drawing and is not an integral part of the design. Besides, there is little or no margin.

In Figure 2 the arrangement is too obviously balanced and therefore lacking in interest. Then too, the lettering is too heavy for the rest of the drawing. The candle is not appropriately placed, because it is exactly in the center. The margin is too narrow and is of the same width on all sides.

Figure 3 could be made into a much better composition if the margins were a trifle wider and if there were variety in their width. As it is now, it seems to be slipping off the card.

Figure 4 presents the best arrangement. The surface of the card has been divided in an interesting manner, the lettering

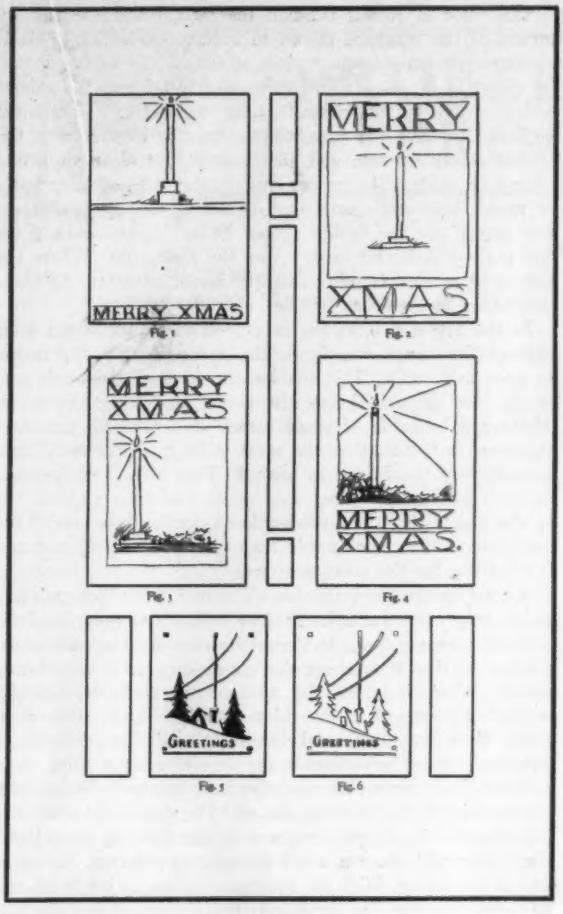


PLATE 1

is an integral part of the design, and the entire design has unity. The margins, too, are sufficiently wide.

After having decided on the motif, the size and kind of paper, and the best arrangement, the next step is to make a dummy—that is, a sketch in color on the kind of paper and the exact size the finished reproductions are to be. In this way if corrections are required, they may be made before reproduction has been started.

There are several methods by which Christmas cards may be produced. In this article the silk-screen process will be described.

In this method, cards are made by printing the design through a silk-screen stencil. The materials necessary are few and the equipment can easily be made. The first thing required is a wooden frame. This frame should have inside dimensions which are about 2 in. wider and about 5 in. longer than the finished card. It may be made of almost any kind of wood, although it is good policy to have it at least 1 in. in height to prevent the paint from splashing over the top. The joints may be nailed or the little corrugated fasteners which are used for fastening the joints in screen doors may be used. Figure 1, Plate 2, shows a sketch of the frame.

The next thing to do is to stretch organdie as tightly as possible over the frame. This stretching is necessary because much of the success in the making of a good stencil reproduction depends on it. The organdie may be held in place with small tacks.

The next step is the drawing and cutting of the stencil. The drawings which are to be reproduced by this process should be made in large masses of black and white without too much detail. If more than one color is to be used, a stencil must be cut for each color, hence it is easier to use but one color. After the cards have been run off, they may be touched up with bright spots of opaque water color.

In making the stencil, the first thing to do is to make a tracing of the finished sketch on a sheet of tracing vellum in pencil (see Figs. 5 and 6, Plate 1). Figure 5 shows the finished sketch, while Figure 6 shows the pencil tracing. Before cutting the stencil, give the vellum a good coating of orange shellac, which will act as an adhesive later on when the stencil is attached to the silk. After the shellac has dried, the stencil should be cut. If there are any small pieces like the centers of the letter O, these should be marked in some way and saved so they may be attached to the silk separately later on. Any ordinary pocket knife or stencil knife with a good sharp edge may be used for cutting the stencil. The writer has found that discarded dental tools take a very sharp edge and because of their slenderness and fineness are admirably suited for cutting out small designs. The cutting should be done on a piece of glass or zinc.

The next step is to place a piece of newspaper on a table, and upon this place the stencil, shellacked side up. Then the frame with the silk is placed on top of the stencil. A piece of muslin or newspaper is then put over the silk and the whole is ironed with a warm (not hot) flatiron until the shellac melts and the stencil is firmly attached to the silk. Care should be taken not to have any wrinkles in the stencil, and to see that all parts of it are firmly attached to the silk. Any small centers are then put in place and fastened in the same manner. The iron may also be run over the bottom side of the stencil. This makes it easier to see the wrinkles and to attach the small centers. Gummed tape or paper should then

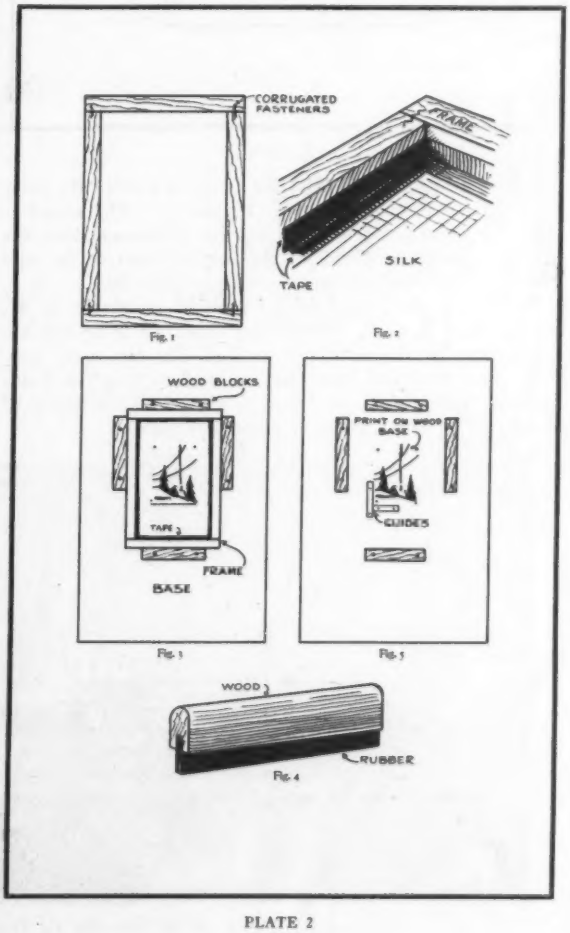


PLATE 2

PLATE 3

be placed around the inside of the frame to prevent the paint from leaking through (see Fig. 2, Plate 2). The screen is then ready for printing. It must be understood that the processes herein described are the simplest and not the ones which are used for making large runs commercially.

In order to do a good job of printing, an absolutely flat surface must be used. Where many cards are to be run, the frame may be hinged to this surface. For our work, however, small blocks of wood may be used to keep the frame in place. This is shown in Figure 3, Plate 2. These blocks of wood may be either nailed or screwed in place.

The color is forced through the stencil and the silk by means of the squeegee shown in Figure 5, Plate 2. This is a strip of rubber set into a piece of wood. The rubber should be about ¼ in. thick. The writer has found that the rubber which is used to sole shoes is quite satisfactory. Care must be taken to have the edge which comes in contact with the screen absolutely true and sharp, otherwise clear-cut prints cannot be made. The rubber may be cut with a sharp knife or razor blade and then trued up on a piece of sandpaper. For truing up, the rubber should be held just like a plane and pushed back and forth across the sandpaper. Where the job to be printed is quite small, it is not necessary to place the rubber in a wooden handle.

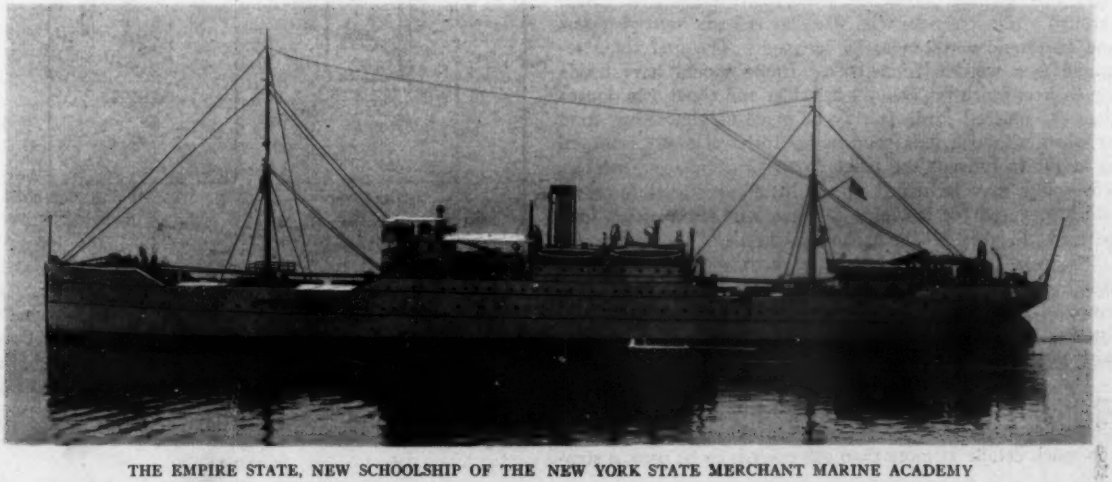
In the actual printing, it is a good idea to run the color through the stencil directly on the printed base before trying to print any cards. This enables one to place the cards correctly. To properly locate the cards, guides are necessary. These can be made of small pieces of cardboard, the same thickness or thinner than the cards to be run. Figure 5, Plate 2 shows how the guides are placed. They should be fastened in place with small tacks.

The reason the frame was made longer than the size of the card was so that there would be a place both at the top and the bottom for the storage of paint.

Special paints are made for silk-screen work, but unless a great many cards are to be run the ordinary oil paint used for artwork may be used. It should be thinned down with turpentine so that it is about the consistency of a very heavy cream. Where it is desirable to have the cards dry quickly, a small amount of japan drier may be added. Where an entire class is going to make cards, it might be advisable to purchase one or two colors in the regular process paint.

After the correct place for the card has been determined, the actual printing may be started. The way to do this is to put the card in the proper place on the printing base, lower the screen and place a small amount of paint at the upper end of the screen. With the squeegee, and using a fair amount of pressure, draw the paint over the surface of the silk and then remove the frame. The paint has been forced through the silk and the stencil on to the card, and then the process may be repeated for the next cards. Nice effects may be obtained by using light colors on dark cards, and as has been mentioned before, the cards can then be touched up with bright spots of opaque water color.

A novel effect may be obtained on a card depicting a winter scene by dipping an old tooth brush in some white poster color and then drawing a knife blade across the bristles. This spatters the white paint on the card and gives the effect of snow. Plate 3 shows several cards which have been made by the silk-screen process.



THE EMPIRE STATE, NEW SCHOOLSHIP OF THE NEW YORK STATE MERCHANT MARINE ACADEMY

PROBLEMS AND PROJECTS

TOBOGGAN

Jos. J. Lukowitz, Milwaukee, Wisconsin

In the making of a toboggan, the bending form should be made first. It would be economical to keep the form from year to year.

For the toboggan staves, white oak serves very well. Hickory may also be used. Oak, however, is easily obtainable, readily worked, and easily bent. Care should be used to select wood with straight grain for the staves. All of the edges of the staves should be rounded to a radius of ⅛ in. to prevent splintering and slivering at the corners. The cleats, nine in number, for 8-ft. staves, may be made of oak. Chamfer all top edges and bore and countersink the screw holes.

Thirty inches of the staves must be steamed or soaked at one end, preparatory to bending. Steaming is much more preferable to soaking and generally more practical, for it is usually difficult to find anything large enough to accommodate 30 in. of the staves for soaking. A suitable steam box, on the other hand, can easily be built of wood to the required length. Cut a hole in the bottom of the steam box and set it over a kettle or pan of water on a gas plate. Insert the staves in the box keeping them separated so as to permit the steam to penetrate all surfaces. Close the open end of the box with a wet burlap to prevent the escape of the steam. The staves should be steamed for four or five hours.

Another method of making a steam box is shown in Figure 2.

When the staves are sufficiently steamed, fasten the bending form shown in Figure 1, on its side so that it will not move when the staves are being bent. Then insert one stave under the edge of the 3-in. cleat on the bending form and bend it around the form. Clamp or tie the stave to the other end of the form. Remove the staves from the steam box one at a

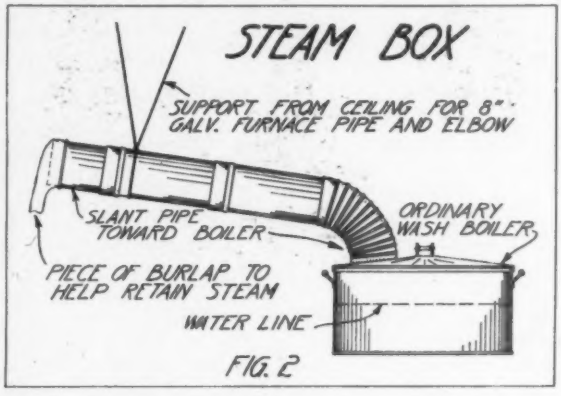

STEAM BOX
SUPPORT FROM CEILING FOR 8" GALV. FURNACE PIPE AND ELBOW
SLANT PIPE TOWARD BOILER
ORDINARY WASH BOILER
PIECE OF BURLAP TO HELP RETAIN STEAM
WATER LINE

FIG. 2

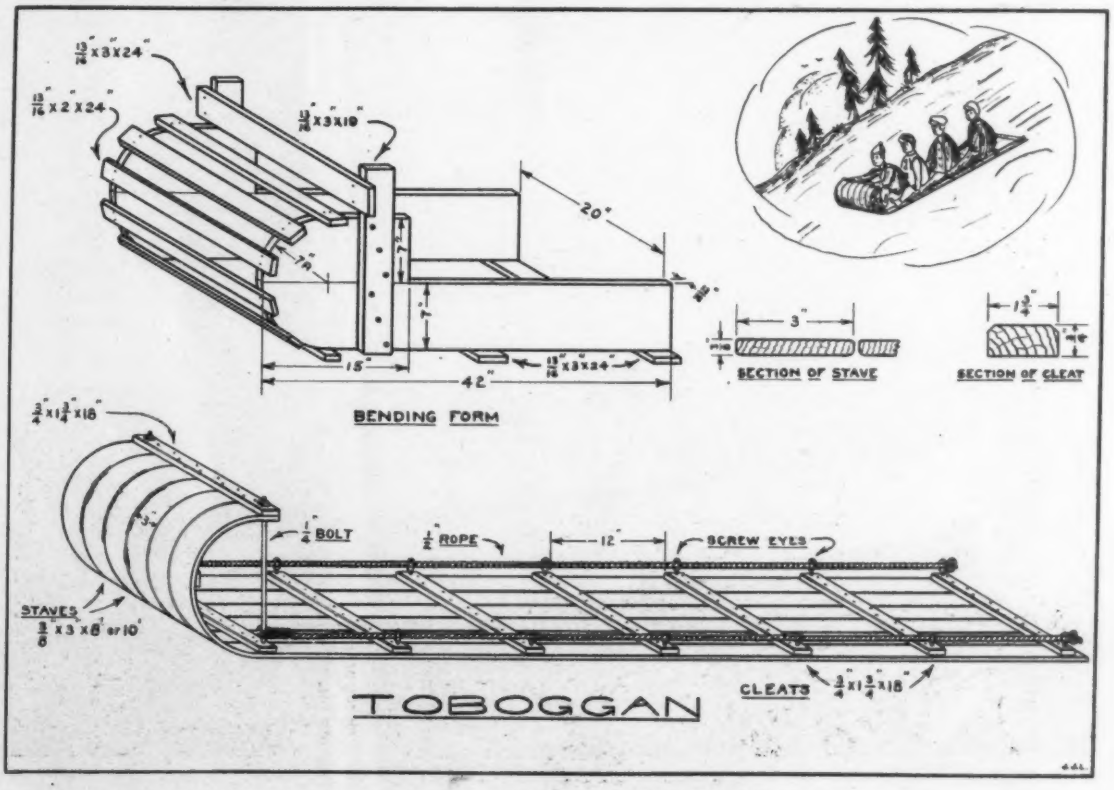


FIG. 1. BENDING FORM AND DETAILS OF TOBOGGAN

time and proceed to bend them in like manner. Allow the staves to dry for at least 24 hours.

Assembly

Begin by fastening the toboggan cleats to the front end of the staves first. The cleats at the top and bottom of the curve should be fastened first. Then the one midway between these points. After these three front cleats have been fastened in position, fasten the one near the end of the toboggan next. Then space the remaining cleats evenly and fasten them in place. Do not butt the staves edge to edge; allow a scant ⅛ in. between them for possible swelling. A piece of chain or leather may be used in place of the long bolt to keep the front end bent. This bracing is necessary because in starting the toboggan it is sometimes pulled by the curved part and unless it is braced, damage or breakage may result. If a bolt is used the head should be well countersunk. Chain or leather braces may be held with screws.

The screw eyes which hold the rope handles should be quite heavy. If suitable screw eyes are not obtainable, ½-in. pipe straps will serve in their stead.

As a finish, the toboggan requires at least two coats of linseed oil, or of a mixture of half turpentine and half oil, which will penetrate well.

A FIFTEEN-INCH V-BOTTOM SPEED BOAT

Claude William Horst, Milwaukee Vocational School, Milwaukee, Wisconsin

(See Supplement No. 228)

A simple boat model supplies excellent motivation for the acquisition of tool skill to boys of junior-high-school age. The one herewith described and illustrated, patterned after some of the famous racing crafts, is inexpensive and easy to build, yet involves the use of a rather large variety of tools and a number of the fundamental operations in woodworking.

A piece of dry, fine-grained material (white pine for instance), with the annual rings running as nearly as possible parallel to the top surface, should be selected (see Fig. 2). Check the block for three working surfaces—the top and the two sides—which must be exactly square with each other.

Mark both sides of the block shown in Figure 2 according to profile template A, Figure 1, not omitting the saw line. After the block has been shaped to the profile indicated, cut it in two at the saw line, making two lifts, as shown in Figure 3. If a rather wide blade is used on the band saw, the cutting is simple. By hand, good results may be obtained with a keyhole saw by cutting first on one side and then on the other—that is, follow the line on one side for a short distance and then turn the block and follow the line on the opposite side for a short distance. By changing sides in this way a very accurate cut may be made. The cut need not be smoothed, as the two lifts will be glued together again later on.

There are two important reasons for sawing the block and making two lifts rather than shaping the boat from a solid block: (1) most of the inside of lift II can be removed with a band saw or a keyhole saw, which is a much easier method than hollowing out a solid block; and, (2) the top view of lift I can be cut accurately to the chine, establishing a definite line to work to when shaping the top sides, which could not be done if a solid block were used.

Mark a center line on the top side of both lifts, then using the proper templates, B and C, Figure 1, mark the half breadths for both lifts and also the inside of lift II, and saw out as marked, leaving the line to finish to. The finishing may be done with a disk sander or by hand. Figures 4 and 5 show lifts I and II in the rough. To remove the interior of lift II, bore a ¾-in. hole on the center line at each end and use a keyhole saw. If a band saw is used, saw through the aft end on the center line. The cut is afterward glued up and tacked. All gluing should be done with casein glue. Figure 4 shows lift II with the interior removed. The lifts are now ready for finishing to the line. Figure 6 shows the job glued up ready for shaping the outside.

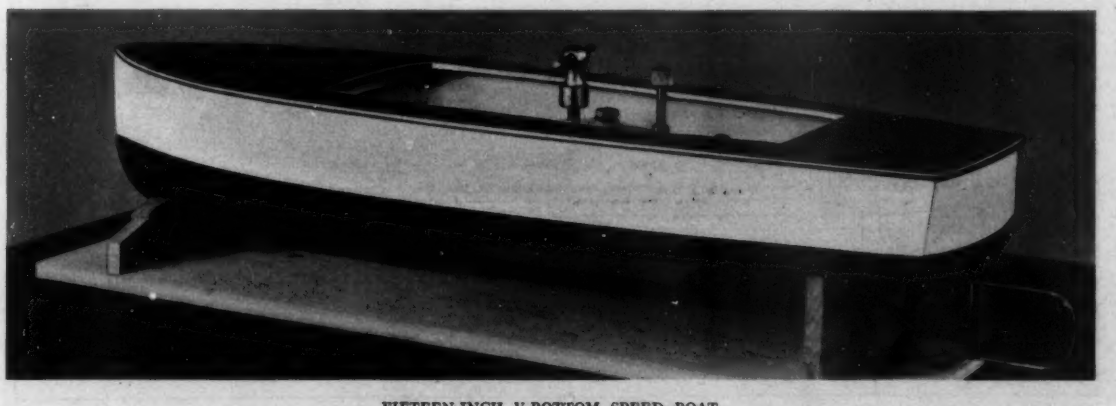
Turn the boat upside down and draw two lines parallel to the center line and 3/32 in. from it (see Fig. 7). This will leave a flat surface 3/16 in. wide to which the keel will be fastened later. On the side or profile of the block draw the chine about ⅛ in. below the saw cut, as shown in Figure 1.

Remove the surplus material from the top sides first—that is, from the deck line down to the chine. A wood file and a spoke shave will be very helpful in shaping the front end. Figure 1 shows the shape of the cross sections. Shape the bottom by removing the excess material from the keel line to the chine, Figure 8. Use file and spoke shave for getting the V section forward. Remove surplus from the inside until the hull shell is about 3/16 in. thick.

Deck beams are made of 3/16 in. by ½ in. material, crowned a little in the center, and notched into the hull, as shown in Figures 9 and 10. The keel is made of 3/16-in. material shaped according to Figure 9 and fastened to the boat with casein glue and brads.

Figure 12 shows the hull ready for paint and deck. The deck is made of ⅛-in. mahogany. Lay the hull upside down on the selected piece and mark out. Cut the piece about 3/16 in. on the outside of the line so the deck may be finished to have a ⅛-in. overhang all around. By rounding off the edge, this projection will simulate a guard. (See Figs. 10 and 11.)

Before the deck is fastened on, give the hull at least three good coats of paint inside and out, allowing about 24 hours between coats. While the paint is drying, finish the deck piece by cutting out the inside and giving it at least three coats of varnish, both top and underside, to keep out moisture. The deck is fastened on with ¾-in. or ⅞-in. brads, countersunk, and heads puttied.



FIFTEEN-INCH V-BOTTOM SPEED BOAT

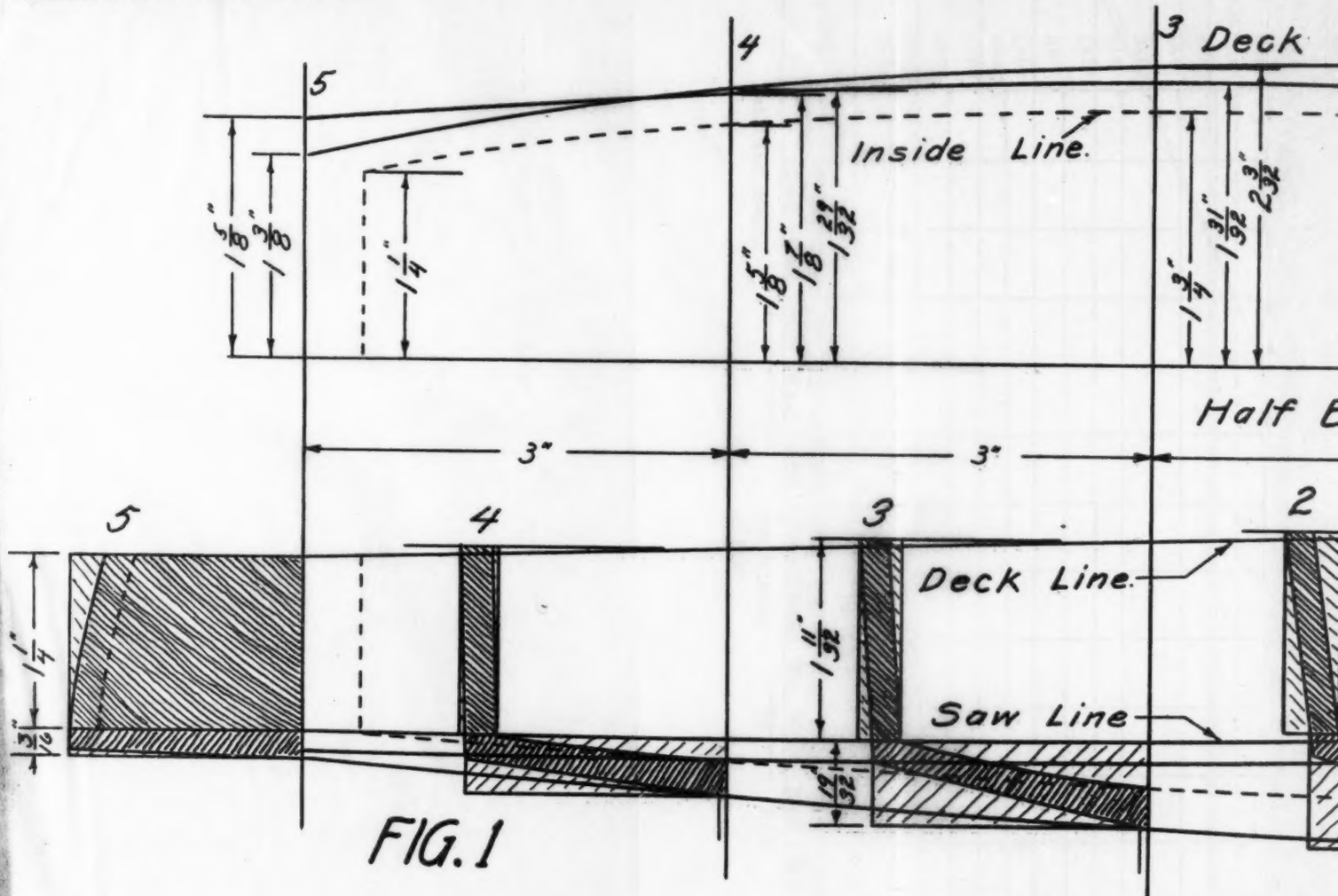
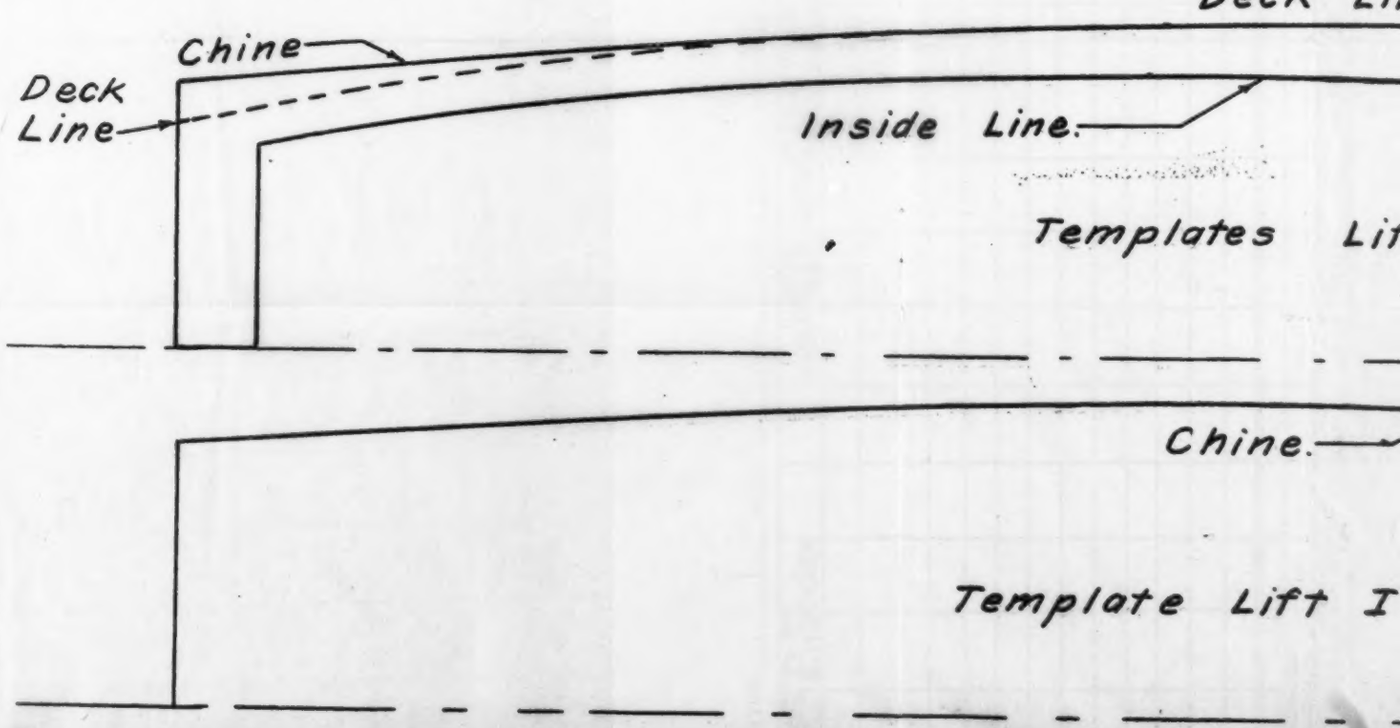


FIG. 1

Profile and St
Deck Li



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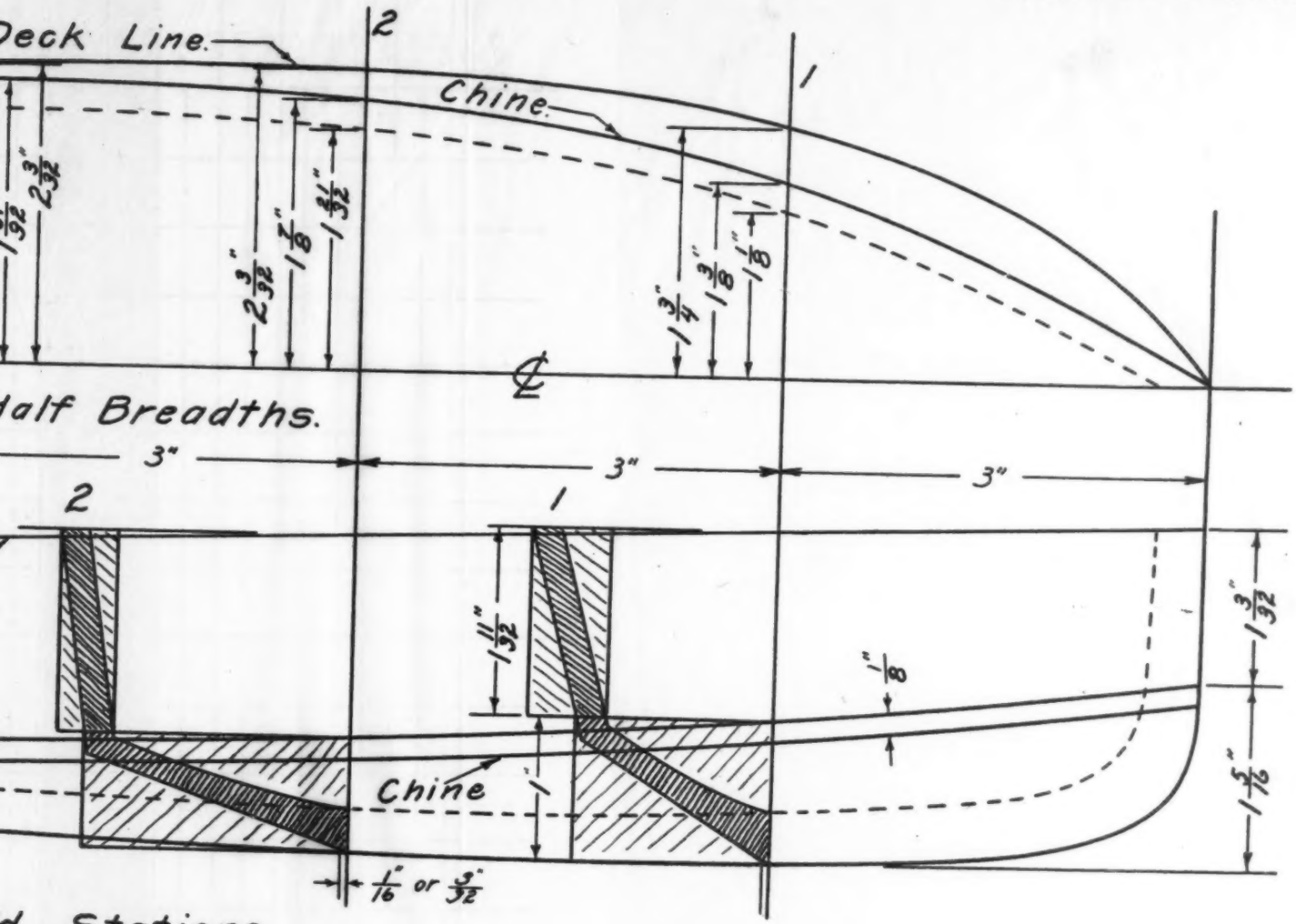


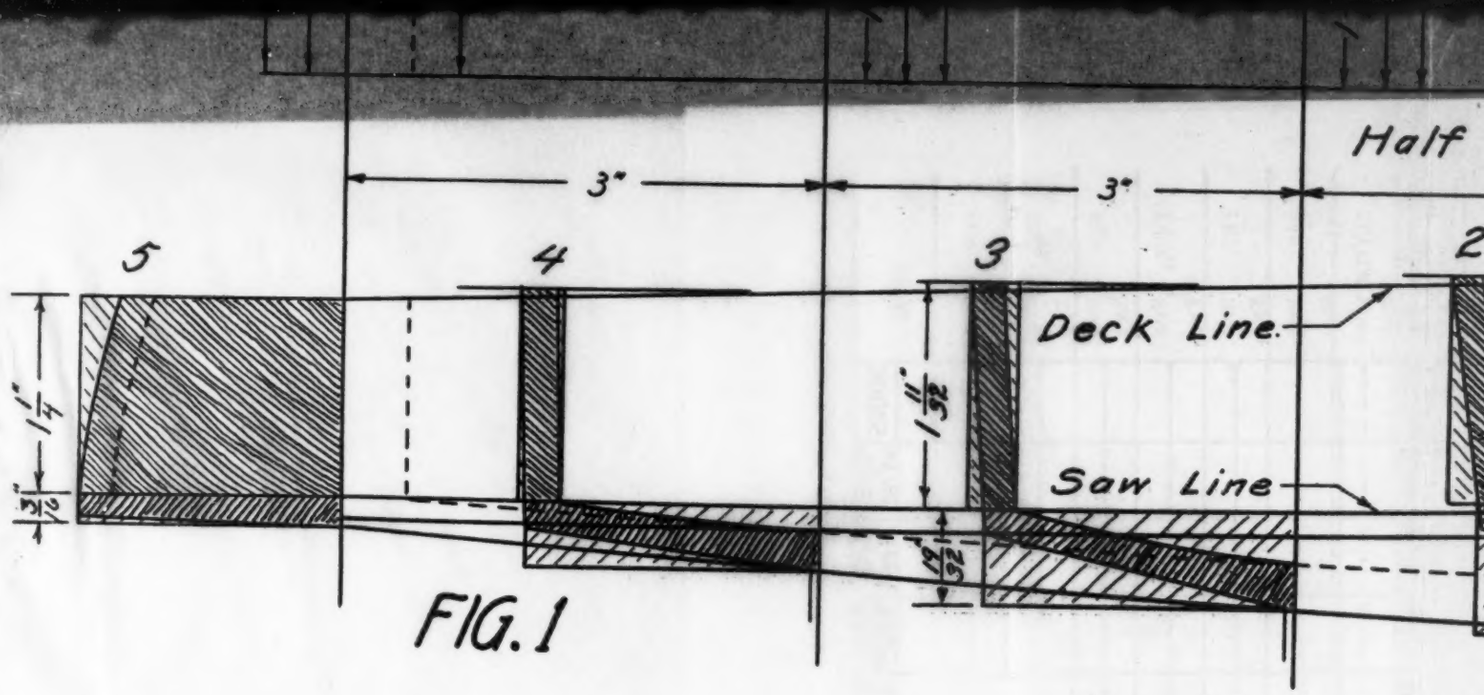
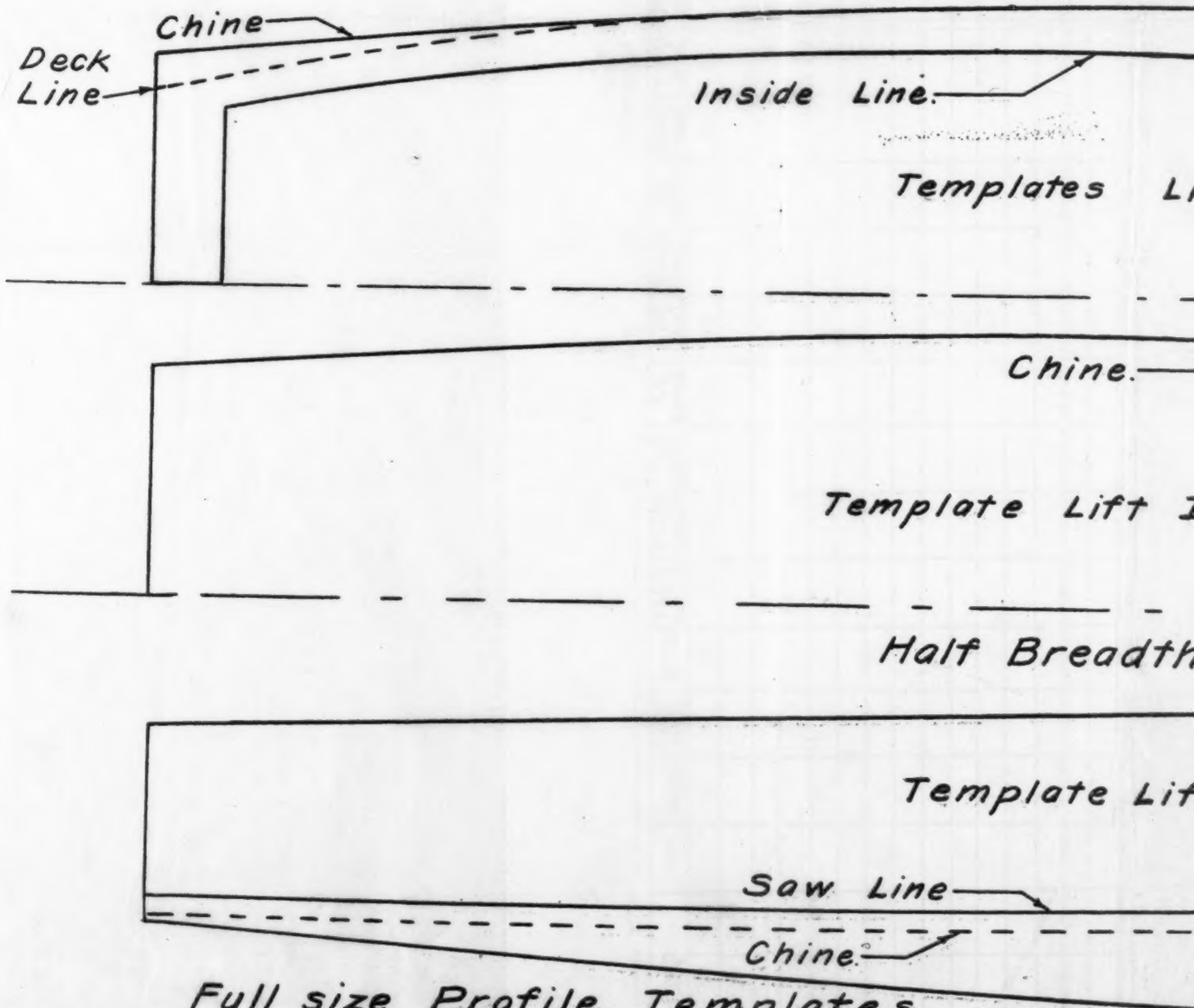


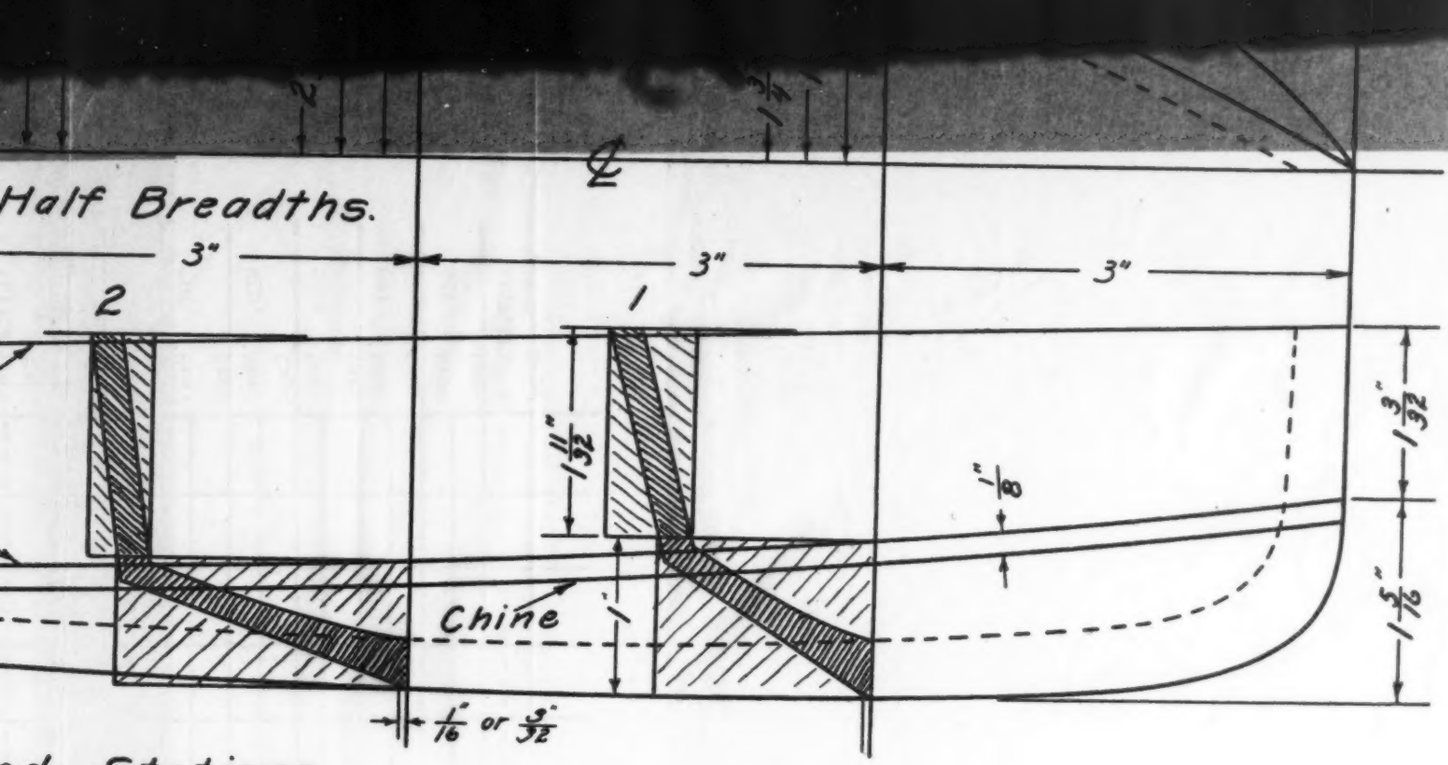
FIG. 1

Profile and S
Deck L



Full size Profile Templates.

Designed by Claude William Horst, Milwaukee, Wis.



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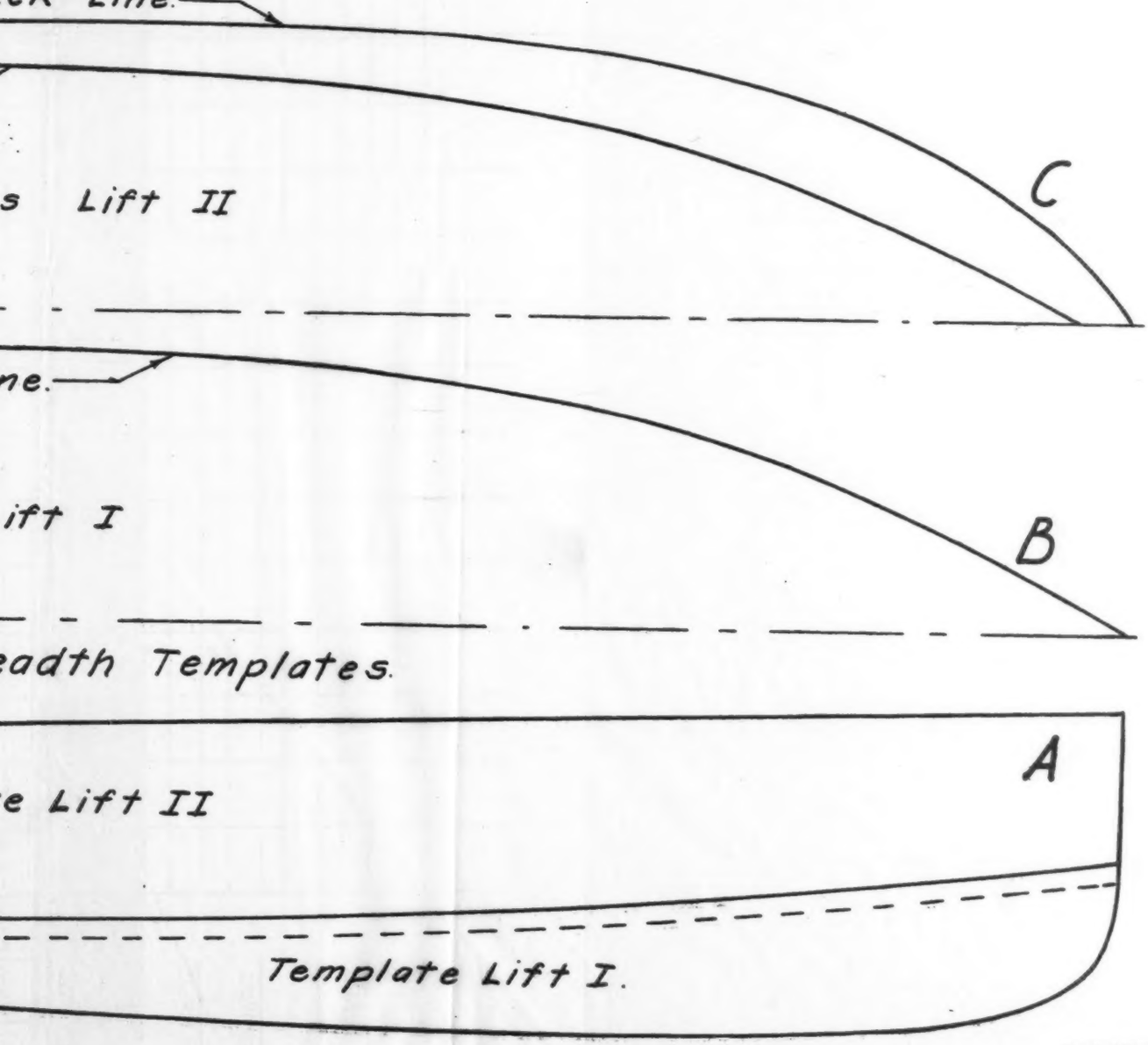


eadth Templates.

Described Elsewhere in This Issue

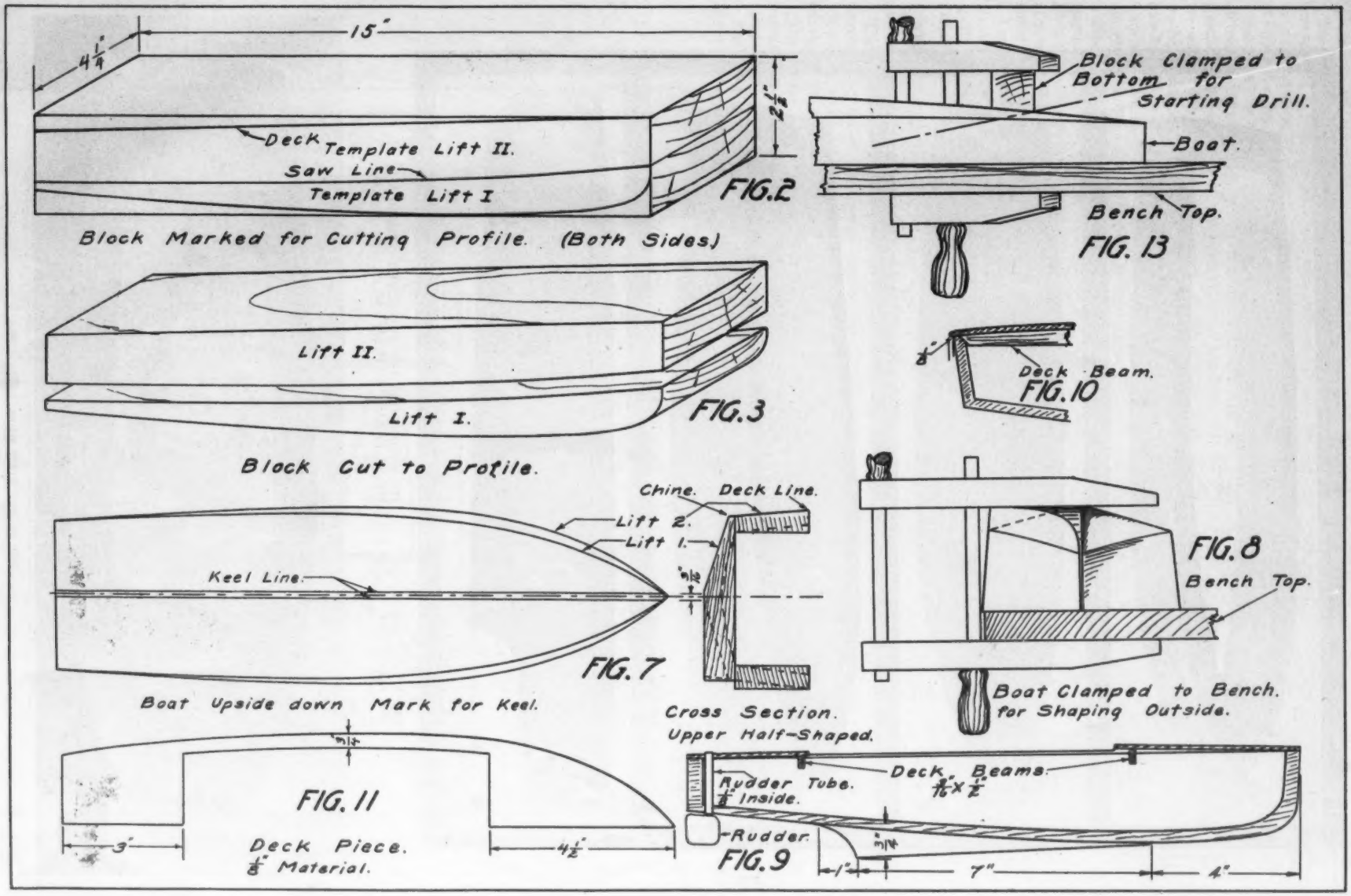


FIG. 2. BLOCK TO BE USED.
FIG. 3. BLOCK CUT INTO TWO LIFTS.

FIG. 7. MARKING KEEL LINE.
FIG. 8. REMOVING EXCESS MATERIAL FROM BOTTOM.
FIG. 9. LATERAL SECTION THROUGH HULL.

FIG. 10. TRANSVERSE SECTION THROUGH HULL.
FIG. 11. DECK BEAMS.
FIG. 13. METHOD OF BORING SHAFT HOLE.

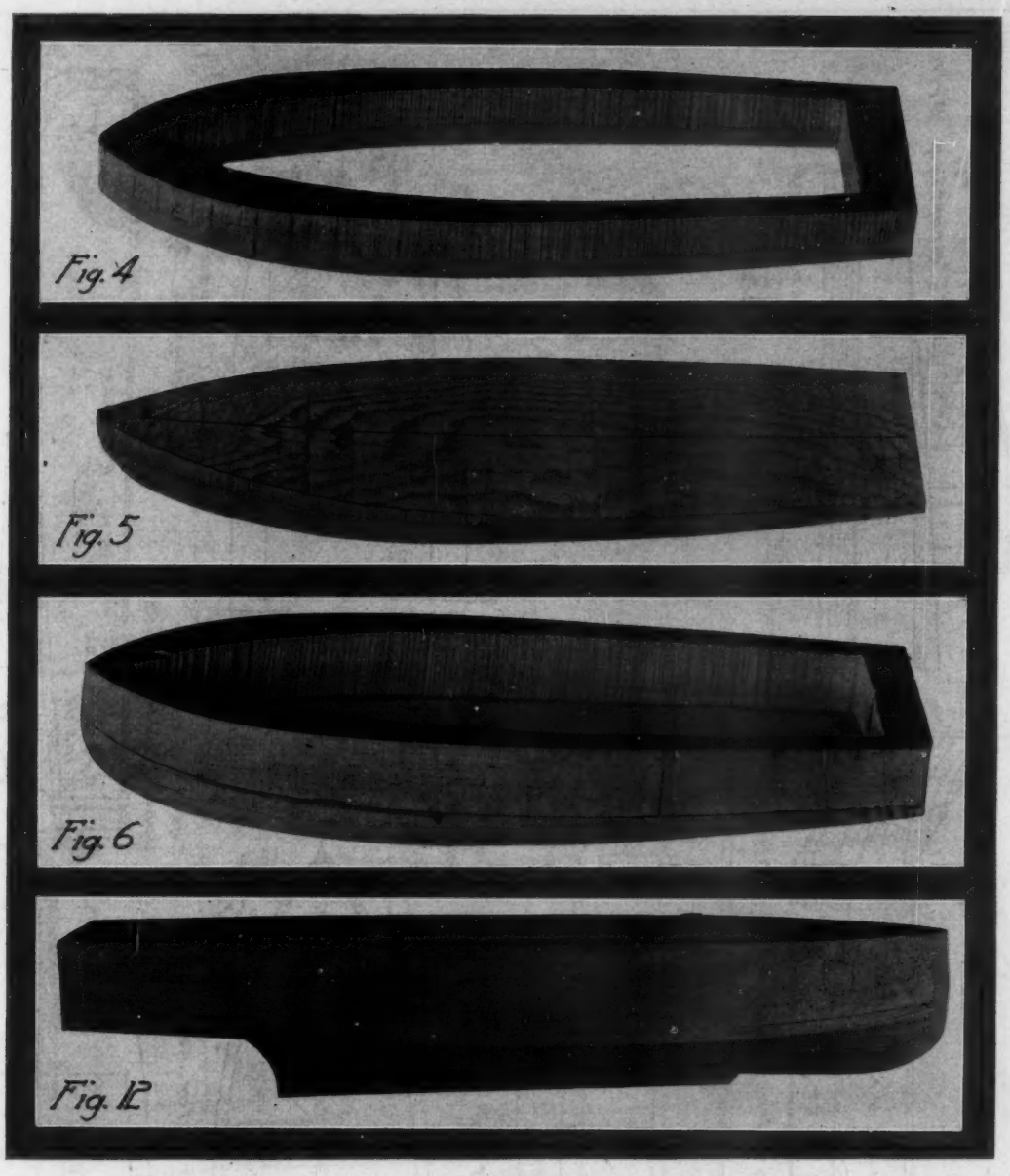


FIG. 4. LIFT TWO.
FIG. 5. LIFT ONE.
FIG. 6. LIFTS ONE AND TWO GLUED TOGETHER.
FIG. 12. UNPAINTED HULL.

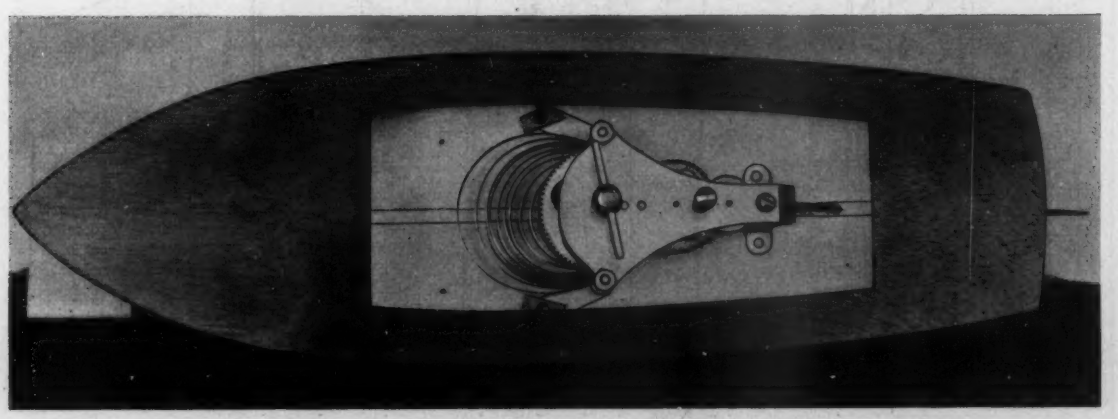


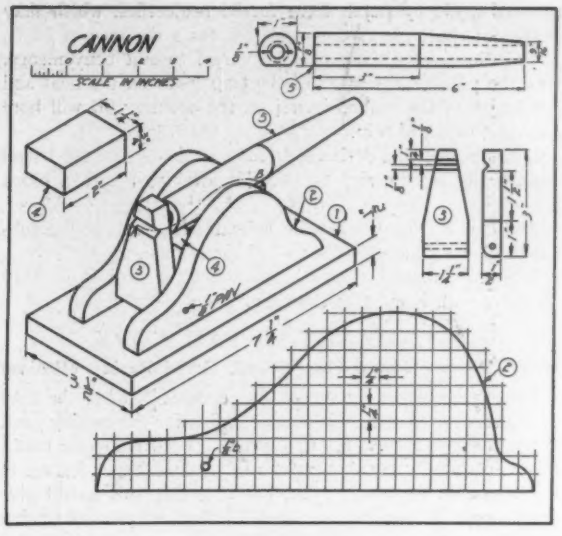
FIG. 14. TOP VIEW SHOWING MOTOR.

The rudder is made of a piece of 30-gauge sheet metal bent around a ⅛-in. piece of wire and soldered. It may be hung to the stern, or a rudder tube may be put in as shown in Figure 9, using a piece of tubing ⅛-in. inside measurement.

Spring motors make very suitable power plants for this type of boat as they are very efficient, inexpensive, and easy to install. Before installing it, place the motor in the boat, put the whole thing in the water, and then shift the motor until the boat balances properly. Locate the position of the shaft hole and determine the proper angle. Figure 13 shows how to start boring the shaft hole. The shaft tube must be a snug fit, otherwise it will be difficult to keep it water-tight.

Figure 14 shows the motor installed. The underwater body may now be painted a different color from the top sides. This gives the boat a snappy appearance and is a common practice at present. The underwater color should extend about 3/16 in. above the actual water line when the boat is floating.

Last but not least, the boat must have a stand, which should accompany it whenever it is taken out to be sailed. The cradle blocks may be shaped according to stations 1 and 4, Figure 1.



CANNON AND EXPLOSIVE BATTLESHIP

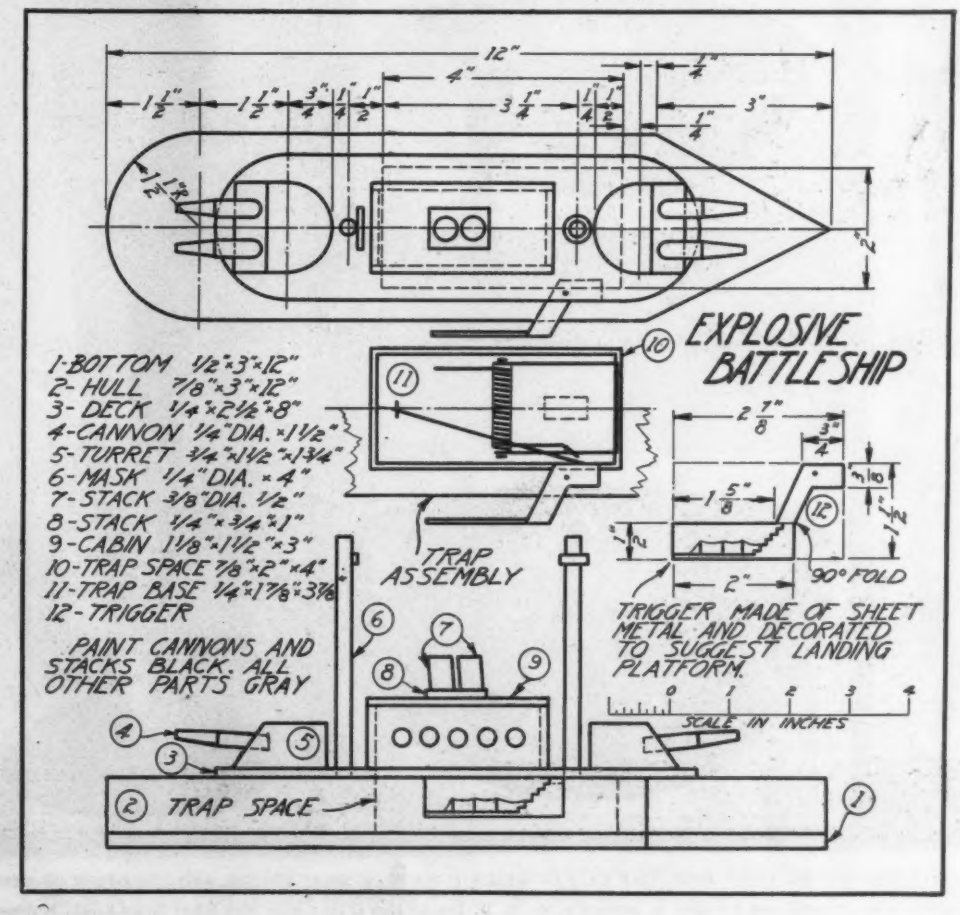
Fred C. Finsterbach, School No. 19, Buffalo, New York

The cannon and explosive battleship shown in the accompanying illustrations have been, despite disarmament conferences, a popular project with the writer's sixth- and seventh-grade boys.

The inherent appeal as a toy, the variety of materials, comparative low cost, and number of different operations, makes this project feasible from an instructional viewpoint.

The explosive force within the ship is the standard 2-for-5-cent mousetrap, with the bait holder removed and the catch bar straightened. The catch bar is "set" under the trigger, which, when moved by the force of the "projectile" from the cannon, releases the bar and the subsequent action of the trap elevates the *loose* deck, turrets, masts, cabin and smokestacks into the air in a rather effective mock explosion. The snap of the trap and the noise of the falling parts adds to the effect.

The action of the cannon is based on the principle of the catapult, except that the trigger strikes the "bullet" projecting slightly from the breech of the barrel. Many of the



cannons made by pupils have forced projectiles, which may consist of short pieces of dowel rod, for a distance of 30 ft.

The dimensions given may be varied to suit convenience, with the possible exception of the trap space on the boat and the length of the cannon barrel, as the ordinary bit will bore only to a depth of 6 in.

It has been found desirable to have students bore the barrel stock while square, and to shape it afterward with a block plane.

The line A-B on the cannon indicates the path of the rubber bands which are the "force" of the cannon.

The only complaint ever heard about the project is, "My Pa plays with it most of the time."

INLAID ART-METAL WORK

H. M. Dexter, Central High School, Grand Rapids, Michigan

Every year before the school term ends, it becomes the duty of the teacher to revise his course outline for the coming year. While engaged in this duty this spring, it occurred to me that I might introduce "inlaid metal work" as an unusual feature in my course in art-metal work, thinking that this would give pupils work of a more complicated nature without increasing the cost.

A copper bowl ordinarily costing very little, and requiring about one hour's work, would, with the inlaid decoration, require many hours of work and a certain amount of originality in design. The added expense to the department would be almost nil, since the inlaying is generally done with scraps of metals which would otherwise be discarded or sold to a junk dealer.

Figure 1 shows a simple design which I introduced into my seventh-grade work. It is a letter opener which appealed greatly to my pupils because it was comparatively easy to make, and yet made a very presentable object when finished.

I would recommend that persons with little experience in this line of work consider inlaying designs of a variety of large and small dots, because this type of inlaying does not require very much mechanical knowledge in fitting the plugs into the design, and will be easily understood from the following:

First, punch a series of round or square holes, or a combination of such holes into the metal in such order that the holes punched will form the desired design or decoration.

With the same punches, punch holes into the metal you desire to use as an inlay. Of course, the color of the inlaying metal must be different from that into which it is inlaid. Use the chips of metal your punch removes from the inlaying metal as plugs in your design. This will be comparatively easy because the same punch which formed the nests, also makes the plugs to fit into them.

One or more of these plugs may be placed into their respective places at a time. If one is to be placed at a time, place the plug exactly over its nest and give it a heavy blow with the flat surface of a large hammer. Proceed in a similar manner with each one. If several are to be placed at a time, place plugs over their correct positions and place over them a piece of flat steel about ½ in. thick, and strike a heavy blow on the piece of steel. This will drive all plugs into place.

In some cases it is necessary to do the inlaying *before* the articles are shaped, and in other cases it will be found more advantageous to inlay *after* the articles are shaped. Articles

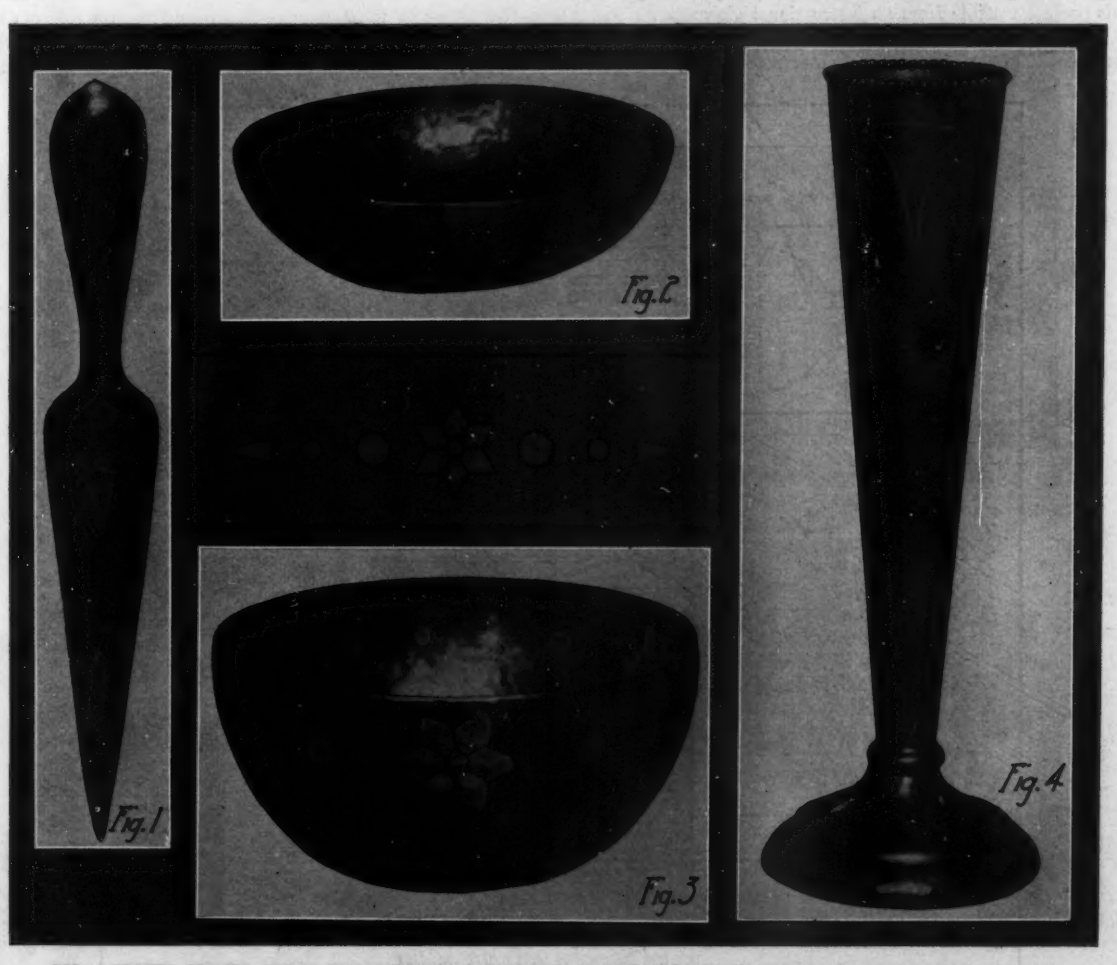


FIG. 1. LETTER OPENER. FIG. 2. BOWL, ONE HALF OF WHICH IS MADE OF SHEET COPPER, AND THE OTHER OF BRASS.
FIG. 3. COPPER BOWL. FIG. 4. COPPER VASE.
All of this inlaid art-metal work was made by members of Mr. H. M. Dexter's class at the Central High School, Grand Rapids, Michigan.

such as bowls, pitchers, and some kinds of vases, must be inlaid after being shaped, while articles like trays, cake platters, envelope openers, etc., must be inlaid immediately after cutting to right size and shape. No article should be finished or planished before the inlaying has been completed.

All articles which in shaping will not shrink or stretch may be inlaid before shaping, because the necessary work of inlaying is much easier while the metal is still flat.

After deciding on a design or decoration, lay it out on the spot where it is to be placed, and cut it out with a scroll saw. Next, cut out of a different metal a piece of the right size and shape to fit this opening. This last piece, called the plug or inlay, must fit very snugly into its prepared nest.

After the inlay has been fitted into its nest, the article should be washed on both sides with a mixture of borax and water, and placed on a sheet of heavy asbestos. If asbestos is not at hand, a level brick surface may be used. Next, deposit a very small amount of spelter or silver solder at the edge of the plug. Then apply the gas torch, at first with just enough heat to dry the spot to be brazed, then gradually increase the heat until the object becomes red-hot when the spelter, or silver solder, will melt and flow into the joint where the two metals meet.

Allow the article to cool slowly, then file, scrape, grind, and buff the inlaid spot until there are no traces of the joining agencies (spelter or silver solder) on or about the inlay.

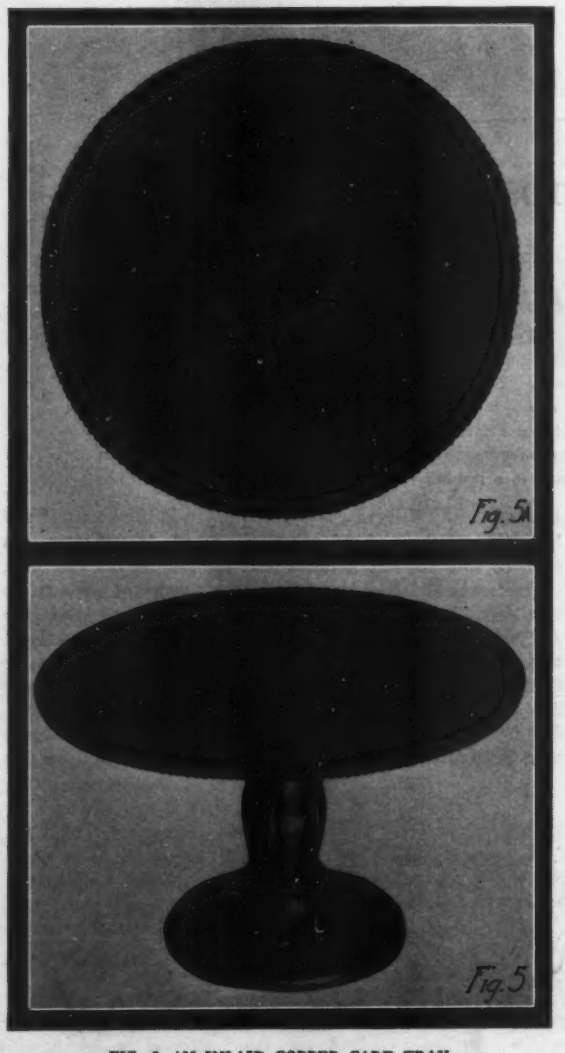


FIG. 5. AN INLAID COPPER CARD TRAY.
FIG. 5A IS A TOP VIEW OF THIS TRAY.

FIG. 6. A COPPER TROPHY TRAY INLAID WITH SILVER.

Next, pickle the object in its proper acid, and let it soak until all burned flux disappears from its surface. Then rinse it with fresh water, scrub it with sand until bright all over, and dry it quickly or else it will oxidize.

The article is then ready to be shaped, planished, or buffed, whichever the case may be. Figures 2, 3, 4, 5, and 6 show other examples of inlaid art-metal work produced in the writer's classes.

READING THE RULE OR SCALE

Arthur O. Gardner, Kosciusko Junior Technical High School, Milwaukee, Wisconsin

This lesson sheet was developed to meet the need of numerous shop instructors who complained that their pupils did not know how to read the rule. It also may be used in the mechanical-drawing class as a teaching device before the actual drawing work is started.

The sheet may be used in three ways. It may be used as a pretest to determine how many pupils can read a rule in order to find out whether it is necessary to do individual or group teaching. Each pupil is given a sheet and is asked to answer all the questions. When three fourths of the class have finished, the papers should be marked. The results of this test will then readily show the type of teaching necessary.

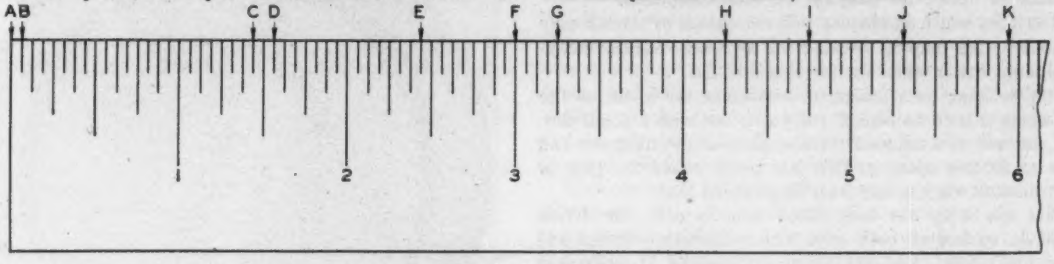
If group teaching is necessary, the sheet may be used for very effective oral drill. A new sheet should be furnished each pupil. The instructor then drills on the various distances as marked off on the rule. If pupils are asked not to mark answers on the sheet, one set of the sheets may be used by all the classes for oral drill. A period spent on oral drill using the sheet usually produces results which are exceedingly helpful and satisfactory.

Lastly, the sheet may be used as a final test to determine where individual teaching must be done. The most economical use of the sheets is that of using them for oral drill only. One set of sheets can be used for all classes and from semester to semester. But paper is cheap and the final test to determine where individual help is necessary should not be omitted.

The sheets may be easily made on the standard mimeograph machines and on very cheap paper. They serve as a valuable teaching device below the ninth grade and as a remedial device beyond the ninth grade. Reading the rule is a fundamental ability every boy should have acquired before entering the ninth grade.

Reading the Rule or Scale

The commonly accepted unit of linear measure in the United States is the inch. This unit is subdivided into sixteen parts. Each part is called "one sixteenth" of and inch and is written 1/16". See A to B. Two sixteenths equal one-eighth inch; see C to D. Four sixteenths equal one-quarter inch; see F to G. Eight sixteenths equal one-half inch; see H to I.



How far is it from

A to B?	A to I?	B to G?	C to F?	D to F?	E to G?	F to I?	H to I?
A to C?	A to J?	B to H?	C to G?	D to G?	E to H?	F to J?	H to J?
A to D?	A to K?	B to I?	C to H?	D to H?	E to I?	F to K?	H to K?
A to E?	B to C?	B to J?	C to I?	D to I?	E to J?	G to H?	I to J?
A to F?	B to D?	B to K?	C to J?	D to J?	E to K?	G to I?	I to K?
A to G?	B to E?	C to D?	C to K?	D to K?	F to G?	G to J?	J to K?
A to H?	B to F?	C to E?	D to E?	E to F?	F to H?	G to K?	

Jobs to be Done in December

J. H. Dillon, Junior High School, Bloomington, Indiana

Editor's Note: **The jobs outlined here have been used by Mr. Dillon to make his school shopwork function in the home. He issues these bulletins (of which the one here shown is the fourth) in mimeographed form to his pupils. They act as an incentive and as a reminder.**

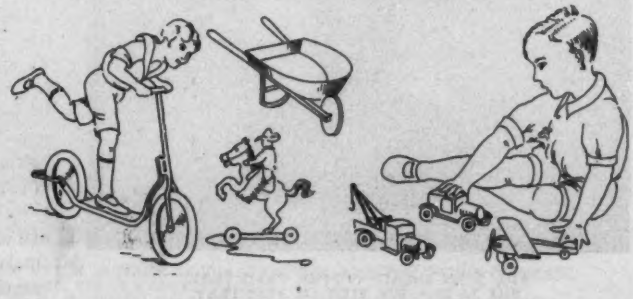
Repairing and Repainting Old and Broken Toys

When dad has a breakdown in his car he calls the garage man. When little brother has a broken wagon or auto, or when little sister breaks a wheel on her doll buggy, you should be anxious to gladden their hearts by fixing this break or giving the old toy a bright, new coat of paint.

Gather up all the old or broken toys around your home and take them to your workshop, or ask your teacher whether you may bring them to the general shop at school. Then patch or replace all broken parts and give the toys a coat of paint. You will find that your work makes these old toys as welcome as though they were new. If brother or sister has outgrown any of their toys, there are many children in the community who do not get a lot of new toys for Christmas. These repaired and repainted toys will give these children many hours of happiness and joy. If each boy in the general-shop class will fix one old toy, there will be enough to gladden the hearts of many of these unfortunate youngsters who would otherwise get no toys for Christmas.

Fixing the Christmas Tree

Christmas Eve is not complete without a Christmas tree, especially if there are young children in the home. If you have the privilege of going into the woods to cut your own tree, be sure and cut it down near the ground. In this way, no bad snag is left sticking up in the woods for someone to trip over. Besides, you need the extra length in the tree stub for placing it in the stand. Trim off the lower limbs, and cut the stub off square. There are several types of stands for Christmas trees in common use. The one shown here is very simple, the size of the box depending on the size of the tree. Fill the box with enough sand to hold the tree solid and prevent it from tipping over. Be very careful with any candles

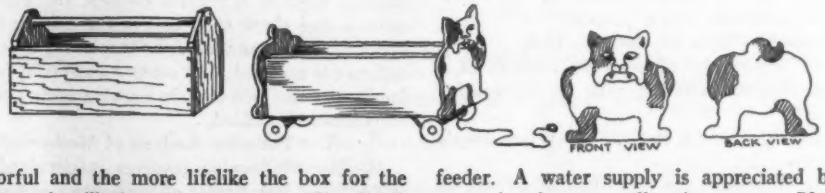


or fire around the tree because the twigs when dry are highly inflammable. If electric lights are used, make sure that all connections are taped and well insulated. These lights for the Christmas tree are usually hooked in series and the current

must pass through each bulb. When the wire in one bulb is broken the circuit is broken and no electric current will flow through any of the other bulbs. You should, therefore, always have one or two extra bulbs on hand.

Making a Box for Baby's Toys

Little brother or sister is learning very fast and forming habits that will affect his or her future life. It would be much better to teach them to keep their togs or belongings in a certain place rather than drop them where they were used. Many people never form the habit of having a place for everything and everything in its place.



The more colorful and the more lifelike the box for the baby's toys, the more it will please the youngster. The sketch shows a few suggestive designs for this box. If baby likes dogs, make it so that it represents a dog; if he likes cats, shape it to represent a cat. Casters placed on the bottom will make the box movable and it can be pulled about, even when full of toys. Teach little brother to take care of his toys, then he will take better care of your tools when he starts to work in your shop.

Attracting Birds to Your Home by Winter Feeding

During the season when the natural food supply for the birds is at the lowest ebb, they respond more readily to our hospitality. Winter feeding has become very popular and the result has been to bring about a better understanding between the birds and their human friends.

The winter foods commonly used include suet, or other fat, pork rinds, bones, shreds of meat, cooked meats, cut-up apples, bird seed, buckwheat, crackers, crumbs, cocoanut meat, cracked corn, broken dog biscuits, or nut meats, or other bread, whole or rolled oats, peppers, popcorn, pumpkin or squash seeds, raw or boiled rice, sunflower seeds, and wheat.

Feeding devices not affected by the weather are preferable. An excellent one is a cocoanut shell with a hole made in one end as shown in the sketch. The cavity is filled with chopped suet and nuts and other food mixture, and the cocoanut is suspended by a wire from a limb. The size of the hole regulates the character of the guest; if small, large birds cannot gobble the supply of food. The cocoanut meat, as well as the stuffing, is eaten. Cans with small openings may be substituted for the cocoanuts. The cracks and holes in a decayed limb are ideal places in which to put food. Suet may be melted and poured into these openings. Tree guards similar to those shown in the sketch may be placed on poles or on trees where cats might climb up to disturb the birds at the

feeder. A water supply is appreciated by these feathered guests in winter as well as in summer. If running water cannot be provided, that supplied should be warmed to delay freezing.

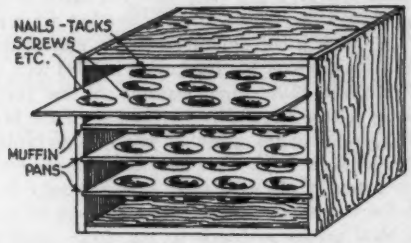
Screw Tray for the Workshop

Muffin-pan trays used by the housewife in baking, make serviceable containers for nails, screws, and other small articles used in a shop. The illustration shows the pans sliding in saw slots cut into the sides of a box.

The box is made with the end pieces lapping over the top and bottom, this being a better construction to carry the weight of the trays. The wood used in the sides is ⅞ in. thick, in order that a saw cut may be made to the depth of ¼ in. without weakening the support. Thinner wood may be used instead of saw cuts if small strips of wood are nailed against the side on which the trays may slide.

Sharpening Kitchen Knives

When your pocketknife gets dull you sharpen it at the school shop or on your own grindstone. Mother does not have a chance to do this; that is one of your jobs. Gather up all



the butcher and paring knives around the house and either bring them to the general shop at school, or take them to your own shop or to a friend's shop where there is a grinder. Grind the cutting side to a long thin edge as shown in the sketch. With an edge of this shape, the knife will cut much better and also may be whetted on a stone or with one of the kitchen sharpeners. After the edge is ground down, whet it on an oilstone with a circular motion as shown in the sketch. Remove the wire edge that forms on the knife by drawing it across a block of wood. Be careful when testing the edge, because a bad cut may result from drawing the fingers along the blade. The proper way to test is to draw the thumb carefully across the blade, then test it by cutting paper.

Always tell those using the knives, when you sharpen them, because a sharp knife should be handled carefully. If care is taken when storing and placing the knives in the drawer, they will stay sharp much longer.

A Coöperative Study Fostered by the A. V. A. Committee on Standards

PART VI—A TENTATIVE ANALYSIS OF MECHANICAL DRAWING

R. W. Selvidge*

The complete plan for this coöperative analysis was set forth in detail on page 189 of the May, 1931, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. The summary is here repeated for the information of those who did not have an opportunity to read the complete statement of the plan.

Summary of the Plan

In order to coördinate the efforts of a great number of teachers who are engaged in attempts to analyze the various industrial-arts subjects and the skilled trades for the learning units involved, the following plan is proposed:

How the Individual Shop Teacher Can Help

On account of the importance of such an analysis as a basis of effective teaching the following plan for coöperative effort is proposed.

1. Every teacher who is interested in such an analysis should join in this undertaking.
2. All industrial-arts subjects, as taught in the high school, are to be analyzed, for the learning units involved.
3. That the principal skilled trades are to be analyzed for the learning units involved.
4. Tentative analyses of the selected subjects, or trades, are to be published and distributed as rapidly as may seem practicable.
5. Any shop teacher or supervisor who is willing to coöperate, or to offer suggestions in the way of modifying, adding to, or taking from, the original list, should send such suggestions or comments to R. W. Selvidge, University of Missouri, Columbia, Mo., or to William T. Bawden, Peoria, Ill., chairman of the committee.
6. Suggestions thus received should be carefully studied, edited, and incorporated, as far as possible, into the original lists, and the revised lists published, together with the names of those who coöperate.
7. Those who are interested should send in the analysis of any subject, or trade, which they have prepared, and which may be used by the committee as the basis of the preliminary analysis. This form of coöperation will be of great value in getting more satisfactory preliminary lists of units.

*University of Missouri, Columbia, Missouri.

In order to get the project started, a tentative analysis of mechanical drawing follows. Those who are interested in coöperating in this matter are asked to study this outline with the view of adding to it anything that should be taught which is not in the list and striking out anything which should not be taught. Teachers should feel free to change the wording of any item to make it more definite, or more inclusive, or more exclusive.

In the study of the tentative analysis the best plan for the teacher is to take some of the jobs which he is using in his shop and analyze them with regard to this list of learning units. Perhaps the easiest way of doing this is to place the learning units in a vertical column, the jobs in a horizontal column, and check each unit in the column in which the job appears. *There must be definite working drawings and specifications for each job, or a correct analysis is impossible.* If it is found that the jobs contain learning units not in the list, such units should be added.

The Tentative Analysis of Mechanical Drawing

Mechanical drawing involves relatively few manipulative skills, but a high degree of proficiency is required in them in order that the drawing may present a good appearance. One may be able to read a drawing accurately, or he may be able to solve a problem of representation so as to give a mechanic a clear and accurate idea of what is required, and yet he may have comparatively little manipulative skill. He is like the man who can read and speak with ease, and can letter so one can read it, but still his lettering is far from satisfactory. A knowledge of the conventions and methods of applying them represents the intellectual side of drawing.

The manipulative side of drawing is represented in the skillful rendering of the solution of the problem. These skills can be acquired only through careful and painstaking practice. Such skill is highly desirable, but should be accompanied by the knowledge and ability necessary to solve the problems.

This analysis would be greatly extended if we gave in detail the items to be considered under each of these headings. The necessity for this would depend somewhat upon the method of instruction; for example, under "How to dimension a drawing," would be "the placing of a dimension," "dimen-

sioning a hole," "dimensioning an arc," and the like. If instructions and illustrations are prepared and available when needed, these items might be arranged as subheads under the single heading, "How to dimension a drawing." There would be sufficient unity in such a topic of instruction, and the instructions and information concerning any particular problem of dimensioning would be available as one of the details under the general heading.

Additional geometrical constructions might be given, but it is believed the student will find it more profitable to spend his time in the solution of the problems of the working drawing, and in the development of skill in rendering them.

The Learning or Teaching Units

The things the student should be able to do:

1. Fasten the drawing paper on the drawing board.
2. Sharpen a drawing pencil.
3. Measure with the scale.
4. Mark points with a pencil.
5. Choose the necessary views of an object.
6. Plan a drawing and make a layout of the sheet.
7. Sketch lines and make a working sketch.
8. Use the T square and pencils in drawing horizontal lines.
9. Use the T square and triangles in drawing vertical lines and lines making common angles with the horizontal.
10. Use the triangles to draw lines parallel to other lines.
11. Clean and care for drawing instruments.
12. Keep the drawing and drawing table neat and orderly.
13. Draw, and know when to use, the different kinds of lines required in drafting.
14. Erase pencil lines.
15. Block out views.
16. Make a front view and top view and know the relationship of these views.
17. Make a front view and side view and know the relationship of these views.
18. Make three views and know the relationship of these views.
19. Pencil a drawing in correct order.
20. Draw views with hidden edges.
21. Dimension a drawing.
22. Sharpen and adjust a compass lead.
23. Use the pencil compass.
24. Make arrow heads.
25. Make numerals.
26. Lay out a title.
27. Letter upper-case letters.
28. Fill the ruling pen and compass pen.
29. Make a drawing to scale.
30. Ink a line with the ruling pen.
31. Ink a drawing in proper order.
32. Use the compass pen.
33. Erase an ink line or an ink spot.
34. Make a detail drawing.
35. Make an assembly drawing.
36. Check a drawing.
37. Draw sectional views of an object and know when they are required.
38. Make an auxiliary view.
39. Letter notes and specifications.
40. Transfer measurements by the dividers.
41. Divide a line into a given number of equal parts with the dividers.
42. Draw an irregular curve with the French curve.
43. Draw a floor plan.
44. Make a tracing on paper.
45. Make a tracing on cloth.
46. Make a blue print.
47. Measure with inside and outside calipers.
48. Draw bolts with conventional threads.
49. Draw machine parts showing finish, drilled, reamed, and tapped holes.
50. Draw machine parts showing keys and keyways.
51. Determine the true length of a line.
52. Bisect an angle.
53. Bisect an arc.
54. Draw an arc tangent to two lines not parallel.
55. Transfer an angle.
56. Draw an ellipse (two methods).
57. Draw an octagon when the diameter or one side is given.
58. Draw a hexagon when the long diameter is given.
59. Draw a hexagon when the short diameter is given.
60. Draw the development of a square, prism-shaped object.
61. Draw the development of a cone-shaped object.
62. Draw the development of a hexagonal prism cut by an oblique plane.
63. Draw the development of a pyramid-shaped object.
64. Draw the development of a cylinder cut by an oblique plane.
65. Determine the line of intersection between two intersecting prisms and develop the surfaces.
66. Determine the line of intersection between two intersecting cylinders and develop the surfaces.
67. Make an isometric drawing.
68. Make an oblique drawing.
69. Sharpen dividers.
70. Sharpen a ruling pen and compass pen.

The things the student should know:

1. Kinds and qualities of drawing papers.
2. The various kinds and grades of pens and their uses.
3. The kinds of scales used in measuring and for what classes of work each is used.
4. The names and uses of drafting instruments and how to care for them.
5. How sizes of triangles and T squares are measured and how designated.
6. How to select and test T squares and triangles.
7. How to select and care for a drawing board.
8. The qualities and uses of tracing paper and tracing cloth.
9. How to select and care for blue-print paper.
10. How to arrange the lighting in order to protect the eyes.
11. The kind of ink used in drafting.
12. Kinds of pens best suited for lettering.
13. The conventional ways of representing breaks in materials.
14. Occupational information, including success factors, income, and opportunities.

What the student should be:

This list of attitudes and habits which contribute to the success of individuals in any vocation was given on page 191 in the May, 1931, issue of this magazine, and need not be repeated here.

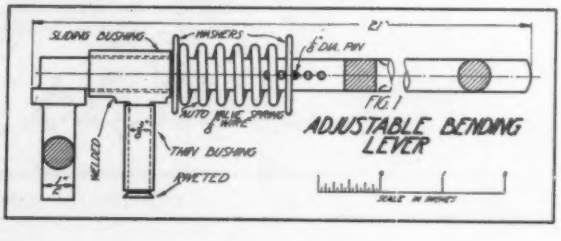
ADJUSTABLE BENDING FORK

T. P. Hughes, University of Minnesota, Minneapolis, Minnesota

The distinguishing features of the bending fork shown in Figures 1 and 2 is the variable or adjustable bending range which is made possible by the movement of the sleeve to which the bender is attached because of the compressing of the spring. This renders it effective in bending to a point beyond the center line of the circle. The writer found its use necessary to bend ⅛ by ½-in. soft-steel stock into the form of a U, the two sides of which were to be parallel.

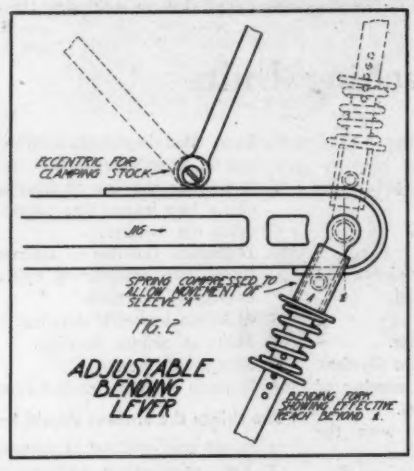
It is obvious that a solid fork could be used only up to the center line shown in Figure 2. But this is not enough to bend the metal sufficiently to keep its shape after the stress is removed, and the metal would always spring back and become V-shaped.

For bends of different diameters, adjustment of the compression on the spring may be made by placing the steel pins in different holes corresponding to the diameters required. This gives a wide range of usefulness to the fork. Figure 2 shows one of its uses in the writer's laboratory.



Materials and Construction

The construction features are very simple and are clearly indicated in Figure 1, although a suggestion or two may be helpful. The sliding sleeve or bushing may be made of a suitable size of pipe or conduit and made square by forming or


ECCENTRIC FOR CLAMPING STOCK
JAS
SPRING COMPRESSED TO ALLOW MOVEMENT OF SLEEVE A
FIG. 2
ADJUSTABLE BENDING LEVER
BENDING FORK SHOWING EFFECTIVE REACH BEYOND A.

forging over a square bar inserted inside. This can be done while the metal is either hot or cold. If the pipe seam should happen to open during this operation, it does not greatly matter as the sleeve is later welded or brazed to the bender and the open seam may at that time also be welded or brazed. The handle may be made of any size of steel, provided it has sufficient stiffness for the service required. The one shown is made of ½-in. square cold-drawn steel forged to a round section on the end. The pivot end may be bent (hot) to a 90-deg. angle or it may be welded or brazed. It should be parallel with the bender. A small valve spring has a higher compressive strength than the stress required to bend most of the light metals used in the school metal shop. The other features need no explanation.

AQUARIUM AND AQUARIUM TABLE

Melvin Campbell, Oak Terrace School, Highwood, Illinois

This project has been found to be a very practical problem in forge and cold-metal work. It would be very appropriate for advanced students in high-school classes as it requires forge work, scroll forming, twisting, and a considerable amount of welding, if acetylene-welding equipment is available.

Use ½-in. angle iron for the corners of the aquarium and miter the corners from both ways. The miters can be cut with a hack saw or on a power grinder. The corners can be held firmly for welding by wiring them on to the corner of a good square brick. Be sure that all joints are perfectly square before welding them. When the frame is complete, cut a piece of 28-gauge black sheet iron to fit the bottom snugly.

Probably the best and cheapest way to get glass to set in the sides is to pick up an automobile windshield and cut it to exact size. In many cases a windshield is just the right

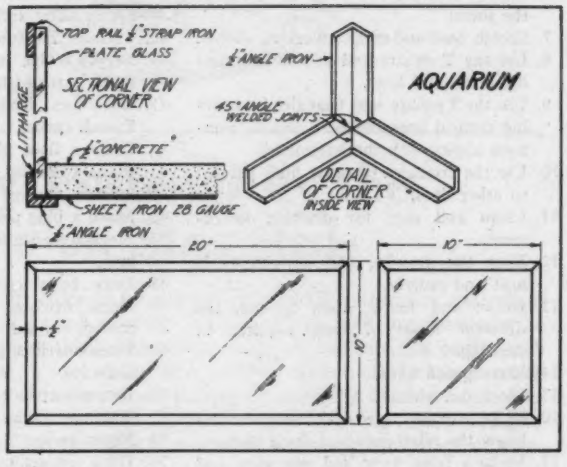


FIG. 1

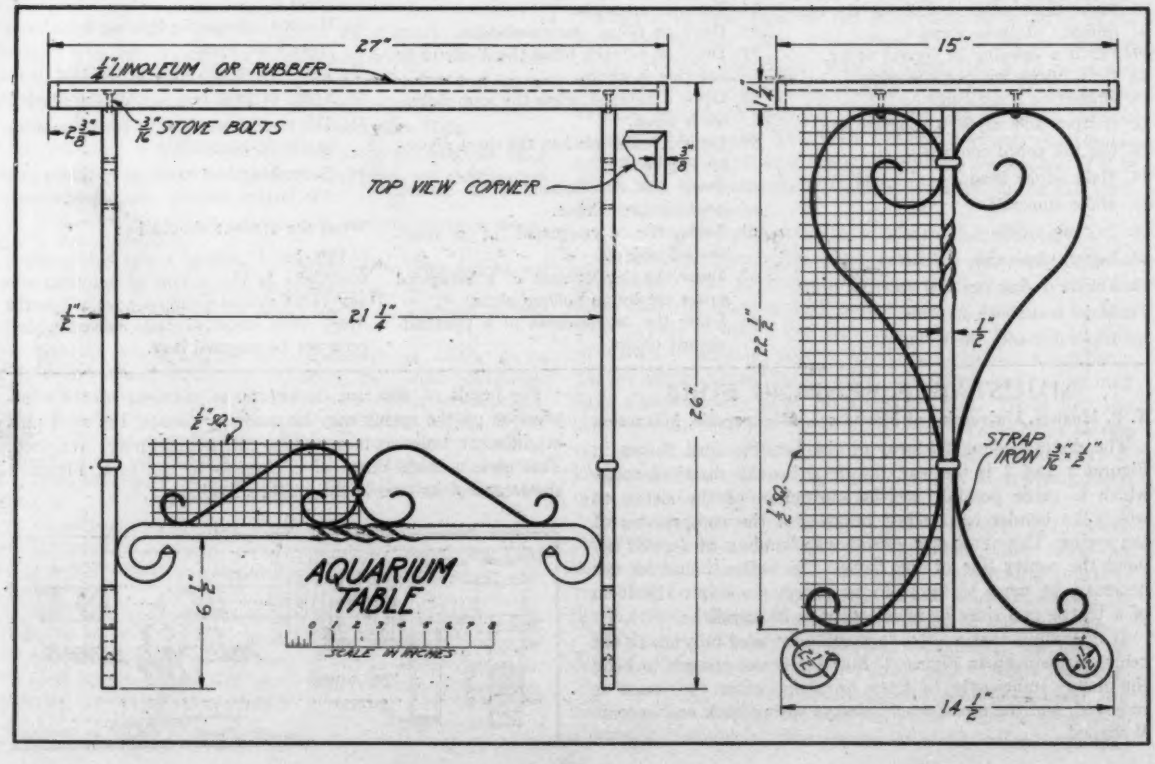


FIG. 2

width and it is only necessary to cut it for length. Cut the glass to fit snugly with each side overlapping the adjoining end. The glass should finally be set in with a mixture of litharge powder and glycerin mixed to a thick, puttylike consistency. The job requires about 2 lb. of litharge and a very small bottle of glycerin. Pack the litharge putty into the corners of the frame and then place the glass in, pressing it firmly against the sides so that the excess litharge is forced out. Fill the inside corners with a little litharge to seal it securely. Allow this to harden for several days, and then put from ½ in. to ¾ in. of a rich mixture of waterproof cement over the metal bottom. Place a little reinforcement of some kind, such as small iron rods, or fine wire netting on the metal bottom before placing the cement. See that the reinforcement rods are all embedded in the cement, because the water of the aquarium must not come in contact with metal, for the chemical action will prove harmful to the fish. When the concrete has thoroughly hardened, paint the surface with a thin mixture of litharge and glycerin to seal the pores in the concrete.

The Table

The ornamental wrought-iron table is very attractive when finished. It could be used as an end table, flower stand, and so on, but it goes especially well with the aquarium.

Materials include: 4 pieces of wrought iron 3/16 by ½ by 42 in. for the end scrolls; 2 pieces ½ in. square by approximately 24 in. (forging varies the length somewhat) for the feet; 1 piece ½ in. square by approximately 31 in. for the stretcher; 2 pieces ½ in. square by 23 in. for the end posts; 2 pieces 3/16 by ½ by 18 in. for stretcher scrolls; and 1 pine board 1 by 15 by 27 in. for the top.

First cut the end posts and heat and twist them at the proper place before cutting to exact length. Then the feet are cut and the end posts are welded to them. Be sure to get them perpendicular. Lay out full-sized scroll patterns according to the design shown in Figure 2. Then form the scrolls and weld them to the posts and feet. Drill the holes in the end scrolls where they will come in contact with the top. Make the top and locate the position of the four holes by placing the ends under it in the proper place. Sink the bolt nuts below the surface of the wood, so they will not interfere with the linoleum or rubber which is to be glued on the top. Forge and twist the stretcher and weld on stretcher scrolls. The stretcher can be wired in its proper place between the ends while it is being welded. Cut the rubber or linoleum a little oversized and glue on with casein waterproof glue. When it has hardened, trim and plane off the edges. Then glue and nail on a walnut or mahogany molding on the edges and miter the corners.

Finish

Use stain and varnish on the top moldings. The iron can be finished in a variety of ways to suit the individual's taste. A finish which is perhaps the simplest and yet looks modern and neat is to brighten the high spots with emery cloth and give it two coats of clear brushing lacquer.

The aquarium frame looks well finished in a bronze lacquer.

SIMPLIFIED SHOW-CARD PEN LETTERING[1]

W. A. Thompson, Principal, Thompson School of Lettering, Pontiac, Michigan

Lesson No. 3

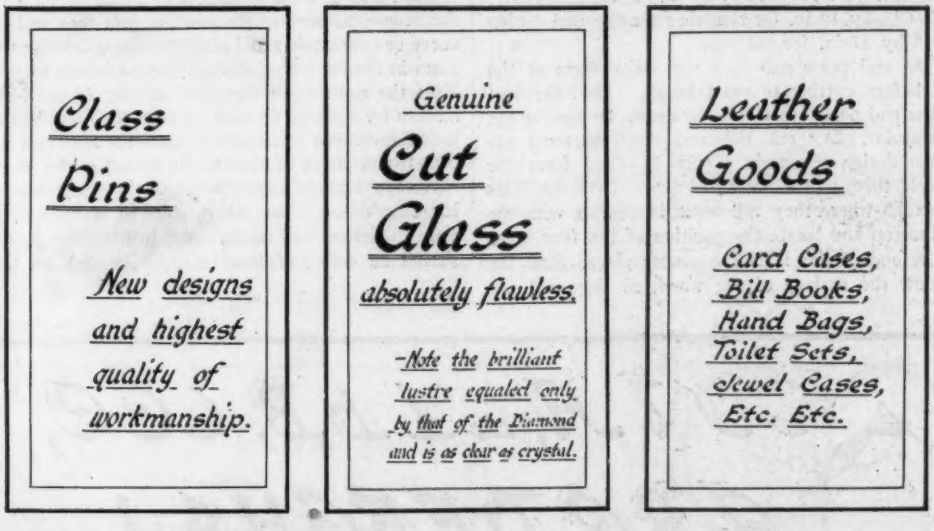
In practicing on this style of lettering, use a No. 1 marking pen. Form the capital letters about 7/8 in. high. Hold the pen about the same as you would an ordinary writing pen or lead pencil and always aim to keep the lettering edge of the pen nib at the same angle with the base line of the lettering. The position of the pen, as indicated in the accompanying alphabet plates, Figures 1 and 2, should be strictly adhered to in making straight-line or oval strokes. Pay particular attention to get the proper position of the pen and you then will find that all curve or oval strokes and straight lines will come true and uniform in the formation of the different letters of this alphabet. Note the position of the pen, and the form of the separate strokes for building up each letter in the first line of the alphabets shown. The small arrows show the direction in which the pen strokes are to be made in the letters shown on these plates.

Always aim to have the capital (upper case) and small lettering (lower case) correspond in slant, and be sure to slant the letters well to the right. In lettering, the pen pressure should be only sufficient to make the ink flow freely. The

[1]Copyright, W. A. Thompson.

FIG. 1. MARKING PEN ALPHABET, UPPER CASE

FIG. 2. MARKING PEN ALPHABET, LOWER CASE



various sizes of lettering is determined by the particular size of pen used. Any size of marking pen, from 1/32 to 1/2 in. wide, may be used to good advantage in general lettering. Careful practice on familiar words will aid you to produce neat and uniform lettering both in spacing and general arrangement.

Note the construction of the letters in the lower-case alphabet shown in Figure 2. The small letters, such as a, c, e, m, o, etc., should be about 1/2 in. high. The tall lower-case letters, h, l, k, etc., should be about the same height as the upper-case capital letters, Figure 1.

Show-Card Copies

The size of the letters may be varied by making the letters tall and slender or by making them low and extended. Study and practice, especially the form and make-up of each letter, you will then be enabled to vary the proportions of lettering and wording for either small or large cards or price tickets. Original size of above cards 7 by 11 in.

Among the Industrial-Arts Teachers

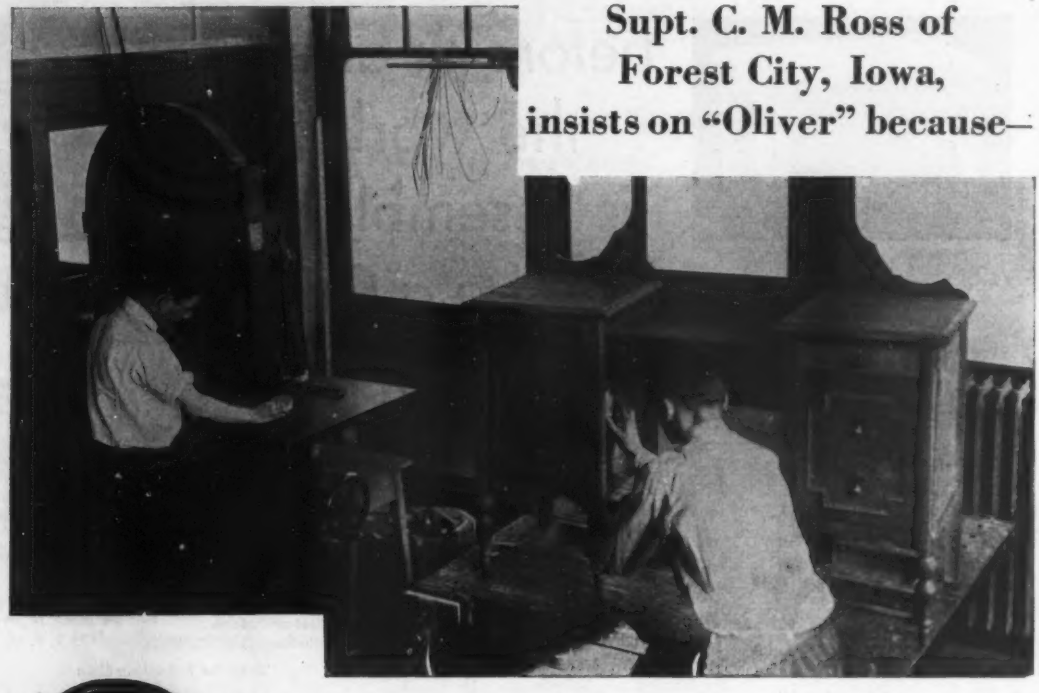
MR. REAGH APPOINTED SUPERVISOR OF MANUAL TRAINING

Mr. Arthur L. Reagh, newly appointed supervisor of manual training of Grand Rapids, Michigan, to succeed the late L. R. Abbott, has had unusually diversified experiences which admirably fit him for his new duties.

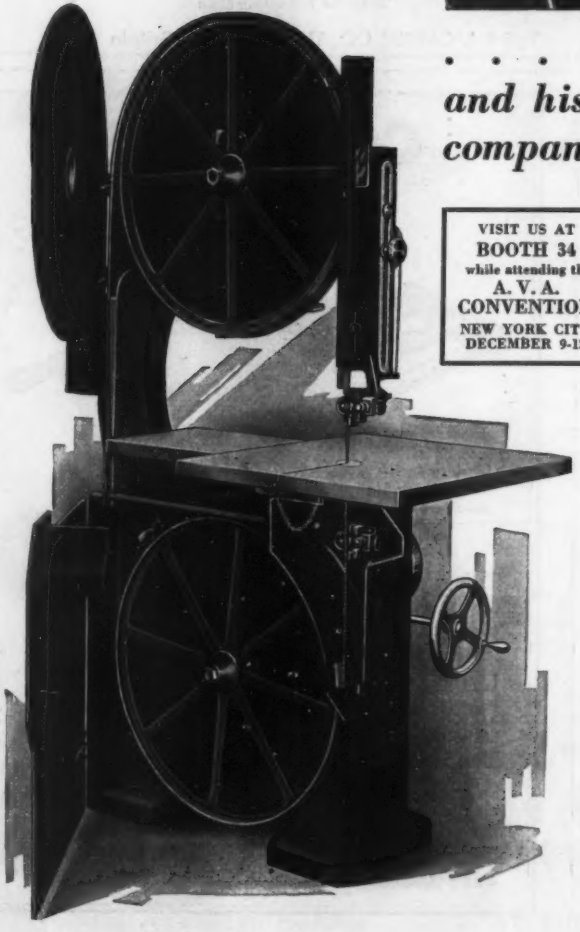
His early education was obtained in the schools of Seattle, Washington, graduating from the Broadway High School there in 1905. The following year he entered the University of Washington, and then transferred to the University of Michi-

(Continued on Page 20a)

"A man is judged by the company he keeps" . . .



Supt. C. M. Ross of Forest City, Iowa, insists on "Oliver" because—



. . . . . he knows that both he and his students are then in the company of an outstanding leader.

VISIT US AT
BOOTH 34
while attending the
A. V. A.
CONVENTION
NEW YORK CITY
DECEMBER 9-12

Superintendent Ross is so convinced that students who learn on machines that are industrial leaders will turn out to be leaders in industry themselves, that he now has the following "Oliver" equipment in his shop: One 30-inch Band Saw, a Speed Lathe, a Hand Planer and Jointer and a Variety Saw Bench.

The above photograph shows the 30-inch Band Saw in use in the Forest City school shop. Left is a front view of this same band saw with guarding doors swung open to show the completeness of safety guarding accomplished.

Such features make it the logical machine for building real furniture. The picture shows that this school shop is doing just that. Another reason why "Oliver" equipment is such a favorite in industry and in the school shop.

May we have the pleasure of sending you a copy of our catalog?

Oliver Machinery Co.

Grand Rapids, Mich., U. S. A.

BRANCH SALES OFFICES:
New York, St. Louis, Minneapolis, Los Angeles, San Francisco, Chicago, Seattle, Manchester, Eng.

For the Finishing Touches

before or after the work is assembled

Use a Carter R-4 Router

R-4 with E Guide

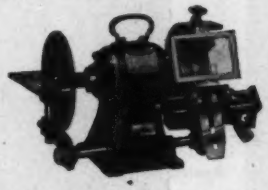
Beading and Fluting Attachment

No. 506 Rounding over Bit — ¾" shank Straight Bit — No. 608 Beading Bit

Guide G for Beading and Fluting

No. 3508 Spindle Bead Cutter

The New Carter Sander and Grinder



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Features:

"Boy proof" chisel and plane iron grinding attachment.

Special grinding wheel eliminates wet grinding.

Adjustable Sanding Table; can be tilted to any angle.

Speed 1725 R. P. M.

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A Saw that never requires Setting or Swaging

HUTHER BROS. PATENT ANGULAR HUB GROOVER

Patent No. 1782507

This saw is ideal for cutting with or end grain. The groover is so free and easy cutting that you scarcely realize the wood is going through.

It has extra free cutting qualities, runs without set and will retain full cutting width during its entire life.

The groover can be used on any saw mandrel without extra collars or fixtures.

Sent on 30 days approval. Write for our complete catalog.

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Equipped with New Adjustable All-Steel Handle

This new All-Steel Adjustable Handle applied to the continuous-screw type of vise makes it practically as FAST in operation as *Rapid-Acting* models, and it will last a lifetime.

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54 Years of Service

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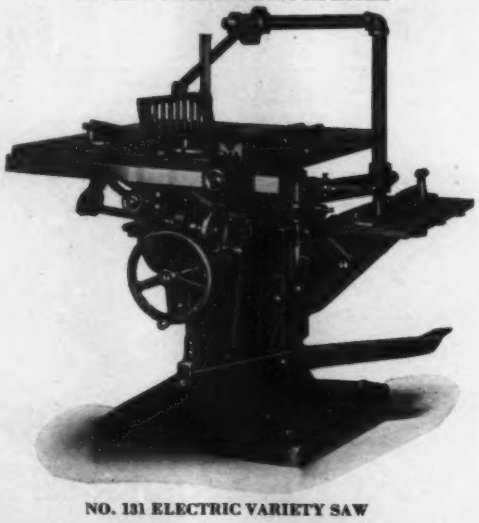
WASHINGTON University in 1879 sponsored what was then a radical departure from the accepted lines of education and organized the first school for vocational education in the country.

The Hall & Brown Wood Working Machine Company sold this school the first 12" Lathe ever used by a manual training school. With this sale began the Hall & Brown service to schools that now extends throughout the United States and many foreign countries.

Leading directors of vocational and technical schools appreciate the importance and advantages of having their students gain an intimate knowledge of machinery and shop practices that are actually being used in industry. As a result outstanding schools throughout the country are equipping their Vocational Departments with Hall & Brown Wood Working Machinery. A list of these schools will be gladly furnished you on request.



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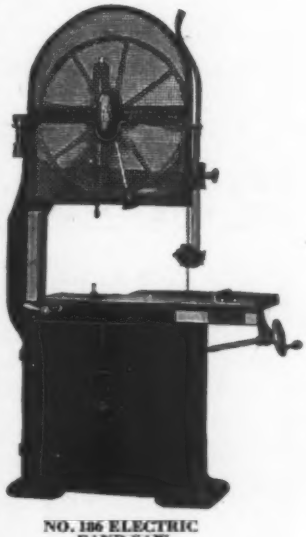

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Only $95.00 for this All Ball Bearing Oscillating Spindle Sander

Now you can have an oscillating spindle sander that will not strain your budget, yet one that will meet all your requirements in finishing curved and irregular work. Oscillation removes all sand marks and utilizes all the abrasive. Table tilts to 45°, securing accurate drafts and angles. Give it only a square foot of bench room in your shop and it will amply repay its low first cost in convenience, time and better workmanship. Won't you drop a card now for further interesting details?

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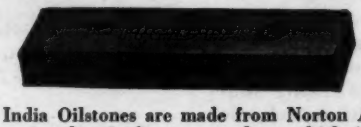
For cutting speed, Pike India Oilstones are unexcelled. At the same time they will outwear any other oilstone and hold their shape better.



Pike India Oilstones are made from Norton Alundum Abrasive, an electric furnace product, which is known everywhere for its outstanding qualities of hardness, sharpness and toughness. Long wear, fast-cutting and absolute uniformity make them of exceptional value in schools specializing in manual training and shop work.

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Pike India Oilstones remain on the job long after other stones are worn out and gone.

Send for your copy of "How to Sharpen." It will please you.

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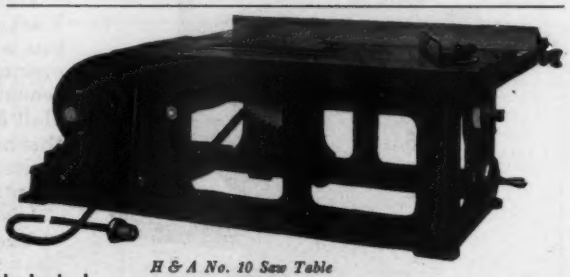

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Keep the tools sharp

PLURALITY OILSTONE TOOL GRINDER

THE most convenient, serviceable and efficient tool sharpening machine ever made.

This Tool Grinder has been carefully designed to combine many new advantages with the essential features of former models. It combines five basic units in one machine: *coarse oilstone wheel, fine oilstone wheel, grinding cone, leather stropping wheel, emery wheel,* and all accessible from two adjacent sides.

It is motor driven, ball bearing throughout, and every unit is thoroughly guarded.

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You can equip your school shops completely and economically with our machines. For years Gallmeyer & Livingston have studied the needs of school shops, with the result that every machine Gallmeyer & Livingston produces fits perfectly every school requirement. Band Saws — Shapers — Combination Saw and Jointers — Lathes — Hollow Chisel Mortisers - - - No matter what your requirements are, Gallmeyer & Livingston can meet them efficiently—and at a minimum outlay of expense. Hundreds of the best schools at home and abroad are equipped with Gallmeyer & Livingston machines.

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fine tools for Student Workers in the Art Metal Crafts

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DIXON is offering valuable prizes in the 1931-32 Scholastic Awards National Contest in Metal Crafts. Encourage your students to compete.

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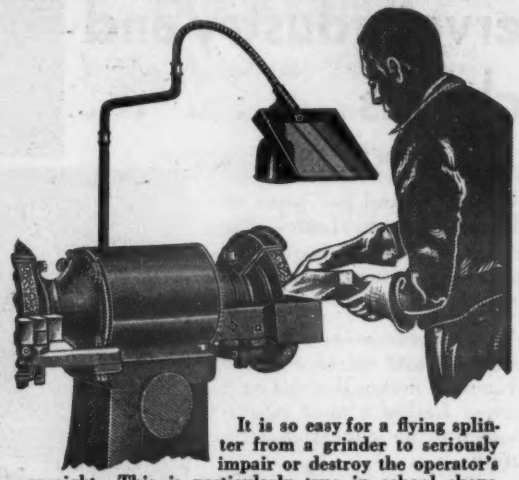

It is so easy for a flying splinter from a grinder to seriously impair or destroy the operator's eyesight. This is particularly true in school shops, where inexperienced hands are constantly using the grinder. The Acme is easily and conveniently fitted to any type power grinder.

Accepted as standard by Underwriters

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The KEYSTONE

Prolongs the life of edge tools in the school shop.

A wet grindstone avoids the possibilities of burning plane irons and other costly cutting tools. Cleveland Grindstones cut fast yet preserve the temper of a tool when bringing it to a keen cutting edge.

The Keystone Iron Frame Power Grindstone is just one of a complete line of grindstones that has achieved almost universal industrial and school acceptance.

The trough on the KEYSTONE is a thick, heavy casting that will last indefinitely. It is cast in one piece, making it absolutely water tight. The legs are cast separately and are securely fastened in place with bolts. An adjustable tool rest with drip pan is furnished with each frame.

Send for complete details.

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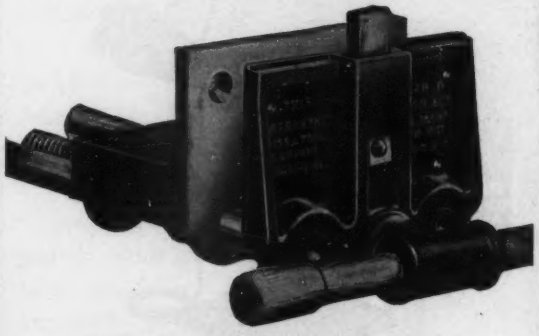

give the most satisfactory service in school shops because of their Simplicity, Strength and Refinement of construction.

Write for copy of our latest circular.

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FOUR SPEED
MANUAL TRAINING LATHE
WITH MOTOR HEAD STOCK

Fig 1115

.... Designed to meet the most exacting requirements!

In keeping with the high standard of every Monarch woodworking machine, this splendid Manual Training Lathe meets the severest requirements of industrial schools, pattern shops, and the woodworking departments of factories. Light in weight but exceptionally strong. Write today for bulletins on this and other Monarch woodworking machines.

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***name on request**

You can't blame Mr. M. L. B., head of a well known industrial arts department, for writing "Savogran Crack Filler sounds too good to be true." Just look at these features: mixes with water—hardens quickly *without shrinking*—saws, cuts, smooths without cracking or crumbling—takes paint perfectly —can be colored for inlays or to match the surrounding surface—and *stays put!* Savogran Crack Filler has hundreds of uses—from covering countersunk screw heads to making casting patterns and repairing wood type.

QUARTER-POUND CAN FREE!

But find out yourself, as did Mr. M. L. B. Fill out and mail the coupon today. We'll send you a quarter-pound can of Savogran Crack Filler and let it speak for itself. And after you try it out, you'll write on your next requisition "Savogran Crack Filler—no substitutes accepted." (Please attach the coupon to your school letterhead.)

ECONOMICAL, TOO! 35-lb. steel pail $7.70, 5-lb. can $1.25, 1-lb. can 30c. No hardening in the can—no solvents to buy—no waste. Quick—efficient—inexpensive!

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Please send me a ¼-lb. sample of Savogran Crack Filler and descriptive literature.

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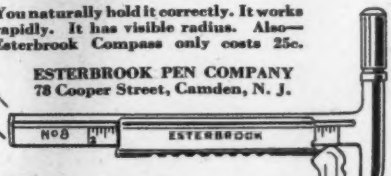

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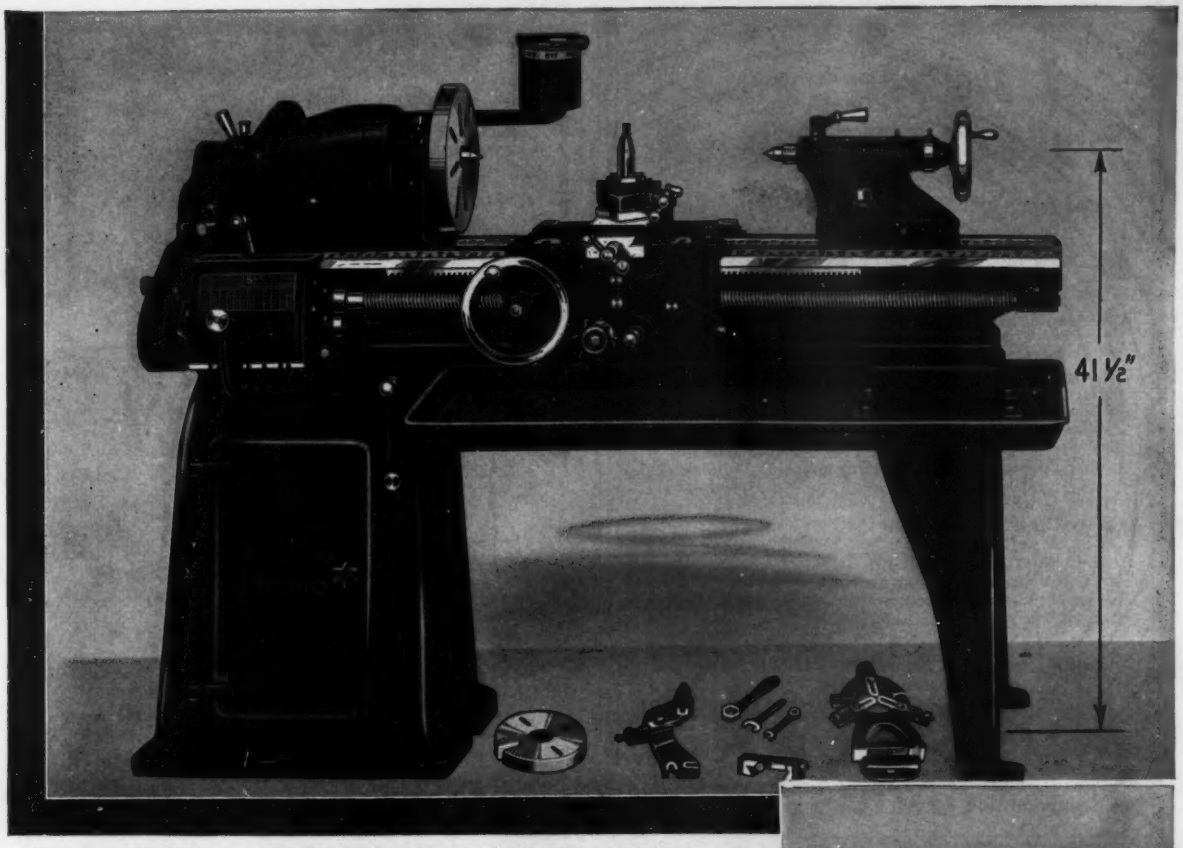

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